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JOURNAL
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ARNOLD ARBORETUM

VOLUME III JULY, 1921 NUMBER 1

NOTES ON NORTH AMERICAN TREES, IX[1]

C. S. SARGENT

NEW SPECIES AND VARIETIES OF CRATAEGUS

Crataegus cherokeensis (§Crus-galli), n. sp.

Leaves oblong-obovate, rounded or acute at apex, gradually narrowed and cuneate at base, finely, often doubly serrate usually only to the middle with acute teeth thickened at apex, glabrous with the exception of a few hairs on the upper side of the midrib early in the season, thin, dark green and lustrous above, paler below, 3.5–4 cm. long, 1.5–2 cm. wide, with a slender midrib and thin obscure primary veins, on vigorous leading shoots usually acute at apex, often acutely lobed above the middle, 4–5 cm. long and 3.5–4 cm. wide; petioles slender, often wing-margined nearly to the base, glabrous, 5–7 or on vigorous shoots up to 10–12 mm. in length. Flowers opening early in April, 10–12 mm. in diameter, on slender glabrous pedicels, in 5–7-flowered globose glabrous corymbs; calyx-tube narrow-obconic, glabrous, the lobes slender, gradually narrowed from the base, long-acuminate, entire or slightly and irregularly toothed above the middle, glabrous; stamens 10, anthers red; styles 1–3, usually 2. Fruit ripening late in September, ellipsoidal, dull orange-red, 10 mm. long, 6–7 mm. thick, the persistent calyx sessile or raised on a short tube; nutlets narrowed and rounded at the ends, only slightly ridged on the back, 6–8 mm. long and 3–5 mm. wide, the narrow hypostyle extending to below the middle.

A small tree with dark slightly scaly bark and slender glabrous often distinctly zigzag branchlets red-brown or orange-brown during their first year, later becoming dark gray-brown, and armed with numerous straight slender spines 3–4 cm. in length.

TEXAS. Cherokee County, upland thickets near Larissa, *E. J. Palmer*, No. 9371 (2), April 7, 1916, type for flowers, No. 10704 (2), September 14, 1916, type for fruit, No. 9372 (2 A), April 7, 1916, (with pink anthers) No. 10705 (2 A), September 14, 1916.

[1]For part VIII see vol. II p. 164.

The narrow oblong-obovate finely serrate leaves and ellipsoidal fruit distinguish this species from *C. Reverchonii* Sargent of the Dallas region of Texas, with nearly orbicular coarsely serrate leaves and smaller globose fruit, the only Crus-galli species with glabrous corymbs, 10 stamens and red or pink anthers which has been found before in the Arkansas, western Louisiana and Texas region.

Crataegus phaneroneura (§Crus-galli), n. sp.

Leaves oblong-obovate, rounded, acute or abruptly short-pointed at apex, gradually narrowed and cuneate at base, finely often doubly serrate usually only to the middle with straight or slightly incurved teeth callous at apex, glabrous with the exception of a few hairs on the upper side of the midrib early in the season, fully grown when the flowers open, 5–7 cm. long and 2.5–3.5 cm. wide, with a slender midrib and 7–10 pairs of thin conspicuous primary veins; petioles slender, sparingly villose on the upper side early in the season, soon glabrous, 8–10 mm. in length; leaves on vigorous leading shoots rarely elliptic, more coarsely serrate, upper to 9 cm. long and 5 cm. wide. Flowers appearing from the middle to the 20th of May, 1.5 cm. in diameter, in broad loose 10–20-flowered, slightly villose or nearly glabrous corymbs; calyx-tube narrow-obconic, glabrous, the lobes slender, acuminate, entire, glabrous; stamens 5 or 6, anthers cream color; styles 1–3. Fruit ripening the end of September in long-branched drooping few-fruited clusters, subglobose, dull red, 10–12 mm. in diameter, with thin dry flesh, the calyx not enlarged, with a broad shallow cavity rounded in the bottom; nutlets rounded at the broad ends, only slightly ridged on the back, 6–7 mm. long and 5 mm. wide, the narrow hypostyle extending to the middle.

A tree 5–7m. high, with a trunk 18–20 cm. in diameter, spreading and erect branches forming an open narrow head, and stout nearly straight branchlets covered when they first appear with matted pale hairs, soon glabrous, light reddish brown during their first season, becoming reddish or gray-brown and armed with many stout or slender straight or slightly curved purple or gray spines 5–6 cm. in length.

MISSOURI. Pike County, hillsides, Clarksville, *John Davis*, No. 1466. November 23, 1912, No. 1468, September 23, 1912, No. 1474, May 20 and September 23, 1912 (type), No. 1475, May 20, 1912, with glabrous corymbs and young branches.

This handsome plant is easily distinguished from all related species in the nore numerous and conspicuous primary veins of the leaves which are similar in the form with villose corymbs and young branchlets which is here considered the type, and in the glabrous form which when the tree is better known will probably be best considered a distinct variety.

Crataegus lawrencensis (§Crus-galli), n. sp.

Leaves oblong-obovate, acute at apex and concave-cuneate at base, or occasionally broad-elliptic and rounded at apex and rarely at base, coarsely often doubly serrate usually only to the middle with broad callus-tipped teeth, and rarely furnished with short lateral lobes, thin, dark yellow-green on the upper surface, pale on the lower surface, glabrous with the exception of a few hairs on the upper side of the midrib, 4–6 cm. long and 2–3.5 cm. wide, and on leading shoots up to 7 cm. long and 4 cm. wide; petioles slender, wing-margined often nearly to the base, slightly villose on the upper side, 1–1.5 cm. in length. Flowers appearing at the end of April, 1.5 cm. in diameter, on slender glabrous pedicels, in 5–10-flowered glabrous corymbs; calyx-tube broad-obconic, glabrous, the lobes gradually or abruptly narrowed from a wide base, slender, long-acuminate, entire or furnished with an occasional tooth, glabrous; stamens about 15; anthers deep rose color; styles 3. Fruit ripening early in October, in slender-branched drooping clusters, subglobose, green tinged with red, about 5 mm. in diameter, the calyx prominent, with a broad shallow cavity; flesh thin, hard and dry; nutlets 3, broad and rounded at the ends, rounded and rarely slightly ridged on the back, about 5 mm. long and 3–5 mm. broad, the narrow hypostyle extending to to the middle.

A small tree with irregularly spreading branches, dark brown scaly bark and slender nearly straight chestnut-brown branchlets becoming dark gray-brown in their second year, and sparingly armed with slender straight spines 2.5–3 cm. in length.

Missouri. Lawrence County, La Russell, *E. J. Palmer*, No. 1, April 22, and October 10, 1908 (type). Jasper County, Webb City, *E. J. Palmer*, No. 18, April 5, 1903.

Crataegus limnophila (§Crus-galli), n. sp.

Leaves oblong-obovate, rounded or acute and often apiculate at apex, gradually narrowed and cuneate at base, finely crenulate-serrate above the middle, glabrous with the exception of a few hairs on the upper side of the midrib early in the season, thin, dark green and lustrous above, pale below, 3.5–4 cm. long, 1–1.5 cm. wide and nearly fully grown when the flowers open; petioles slender, glabrous, slightly wing-margined, 5–6 mm. in length; leaves on vigorous shoots broad-obovate, more coarsely serrate and up to 5 cm. long and 1.5 cm. wide. Flowers opening early in April, about 1 cm. in diameter, on slender pedicels in small compact usually 7 to 10-flowered sparingly villose corymbs; calyx-tube narrow-obconic, glabrous, the lobes slender, short-acuminate, entire, glabrous on the outer surface, villose on the inner surface; stamens 15–20, anthers dark rose color; styles usually 3–5. Fruit ripening the end of September, in few-fruited erect glabrous clusters, ellipsoidal, bright red, 7–9 mm. long and 6 or 7 mm. thick, with thin dry flesh, the calyx little enlarged, with a deep narrow cavity pointed in the bottom; nutlets 3–5, broad and rounded at base, narrowed at apex, about 5 mm. long and 3 or 4 mm. wide, the broad hypostyle expanding nearly to the base.

A tree 8 or 9 m. high with a trunk 18–20 cm. in diameter covered with gray bark divided by shallow fissures, spreading pale ashy gray branches forming a broad round-topped head, and slender branchlets sparingly villose, soon glabrous, and dark red-brown in their first season, becoming lighter in their second year and ultimately gray, and armed with occasional slender straight spines 2.5–3 cm. in length.

FLORIDA. Wakulla County, in the water of deep swamps and in low wet woods near St. Marks, *T. G. Harbison*, Nos. 1206 and 1208, September 25, 1913, No. 1428, March 30, 1914, No. 5692, April 13, 1920 (type), No. 5697, April 14, 1920, with glabrous corymbs and young branchlets.

A plant of the Crus-galli Group growing in wet soil has not before been reported. The small flowers in small compact corymbs, the small ellipsoidal fruit and slender branches well distinguish this species. Crus-galli species are rare in the coast region of the southeastern states, and from Florida only *C. pyracanthoides* Beadle with 5–10 stamens has been previously described.

Crataegus sublobulata (§Crus-galli), n. sp.

Leaves broad-obovate to elliptic, acute or rounded at apex, abruptly or gradually narrowed and cuneate at base, coarsely, deeply and irregularly serrate with acuminate teeth, and often sublobulate with acuminate lobules, tinged with red and covered above with short white hairs deciduous before the flowers open except from the upper side of the midrib, glabrous at maturity, thick, dark green and lustrous on the upper surface, paler on the lower surface, 3.5–4 cm. long, 2.5–3 cm. wide, with a stout midrib and prominent primary veins, or on vigorous shoots often 4–5 cm. long and 3.5 cm. wide; petioles stout, wing-margined often nearly to the middle, grooved and villose-pubescent on the upper side, 1–1.2 cm. or on leading shoots up to 2 cm. in length. Flowers opening late in March and early in April, 1.5 cm. in diameter, on slender glabrous pedicels, in 5- or 6-flowered compact corymbs; calyx-tube narrow-obconic, glabrous, the lobes slender, acuminate, entire or furnished above the middle with occasional slender teeth, glabrous on the outer surface, sparingly villose-pubescent on the inner surface; stamens 20; anthers pink; styles 2–5. Fruit short-oblong to subglobose or rarely to obovoid, orange-red, 8–10 mm. long and 6 or 7 mm. broad; nutlets usually broader at apex than at base, prominently ridged on the back, 5–7 mm. long and 3–5 mm. wide, the broad hypostyle extending to below the middle and often nearly to the base.

A round-topped tree 8–10 m. high, with a short trunk covered with soft corky slightly ridged gray-brown bark, wide-spreading branches and slender slightly zigzag branchlets light reddish brown and glabrous when they first appear, becoming darker during their first season and light gray-brown the following year, and armed with numerous slender straight chestnut-brown lustrous spines, becoming dull gray-brown and 2.5–4 cm. in length.

TEXAS. San Augustine County, borders of upland woods near San Augustine, *E. J. Palmer*, No. 10617 (2), September 17, 1916, No. 13239 (No. 2), April 1, 1918 (type).

The distinct character in this species is the deep serration of the leaves, unusual in plants of the Crus-galli Group. From *C. Bushii* Sargent, the species of southern Arkansas, western Louisiana and eastern Texas with 20 stamens and rose-colored anthers it is well distinguished by the shape of the leaves.

Crataegus intermixta (§Crus-galli), n. sp.

Leaves elliptic to slightly obovate, acute, abruptly short-pointed or rarely rounded at apex, gradually narrowed and cuneate at base, sharply and doubly serrate above the middle with erect acuminate teeth, and on leading shoots occasionally slightly lobed, glabrous, thin, 4–5 cm. long and 2–2.5 cm. wide, with a thin midrib and 4 or 5 pairs of slender prominent primary veins; petioles slender, slightly wing-margined toward the apex, sparingly glandular, 1–1.5 cm. in length. Flowers appearing from the middle to the 20th of May, about 1 cm. in diameter, on slender pedicels, in globose usually 5–10-flowered compact corymbs; calyx-tube broad-obconic, glabrous, the lobes short, gradually narrowed, serrate above the middle with occasional glandular teeth, glabrous on the outer surface, soft-pubescent on the inner surface; stamens 20; anthers pink; styles 1–3. Fruit ripening the end of October, subglobose to slightly obovoid, dark orange-red, 10–12 mm. in diameter, crowned with the only slightly enlarged calyx, with a deep cavity wide in the bottom, and firm hard flesh; nutlets 2–3, rounded at the gradually narrowed ends, about 8 mm. long and 5 mm. wide, with a low broad dorsal ridge; the narrow dark hypostyle extending to the middle.

A round-topped tree 5–6 m. high, with wide-spreading branches, a trunk 17–25 cm. in diameter, dark scaly bark and slender glabrous slightly zigzag branchlets dark orange-brown or reddish and lustrous in their first season, becoming dull gray-brown and armed with many slender nearly straight spines 3–5 cm. in length.

MISSOURI. Marion County, uplands, Riverside Park, Hannibal, *John Davis*, No 6, October 21, 1912, October 13, 1913, May 19, 1913 (type).

This plant has the thin acute sharply serrate leaves of many of the Virides species to which it bears a strong resemblance; the pink anthers, however, are unusual in that group except in the extreme south, and the 1–3 styles, the large solid fruit, the shape of the nutlets, the numerous, long spines and the rough bark all point to the Crus-galli Group to which it is now doubtfully referred.

Crataegus araioclada (§Crus-galli), n. sp.

Leaves oblong-obovate, acute or very rarely rounded at apex, gradually narrowed and cuneate at base, finely serrate above the middle with blunt or acute teeth, occasionally slightly and irregularly lobed, especially on leading shoots, thin, glabrous with the exception of a few hairs early

in the season on the upper side of the midrib, lustrous, 4–5 cm. long, 1.5–2 cm. wide and on leading shoots up to 6 cm. long and 4 cm. wide, with a slender midrib and thin primary veins; petioles slender, slightly wing-margined, glabrous or pubescent on the upper side early in the season, especially on leading shoots, 1–1.5 cm. in length. Flowers appearing the middle of April, 1.5 cm. in diameter, on slender glabrous pedicels, in small compact usually 5- or 6-flowered corymbs; calyx-tube broad-obconic, glabrous, the lobes gradually narrowed from the base, slender, acuminate, entire, glabrous on the outer surface, pubescent on the inner surface; stamens 20, anthers yellow; styles 3–5. Fruit (only one collected) ripening in October, in drooping few-fruited clusters, short-oblong, dull orange-red, 8–10 mm. in diameter, the calyx not enlarged, with a narrow shallow cavity pointed in the bottom.

A tree 4 or 5 m. high, with a trunk 35 cm. in diameter, covered with dark, slightly scaly bark divided into narrow ridges, a wide flat-topped head, and slender slightly zigzag glabrous branchlets bright chestnut brown or orange-brown during their first season and pale gray-brown the following year, and armed with many slender straight chestnut-brown spines 3–4 cm. in length.

LOUISIANA. Natchitoches Parish, border of upland woods Natchitoches, *E. J. Palmer*, Nos. 7234 (3) and 8848 (3), April 16 and October 6, 1915 (type).

This species seems distinct from the described species of the Crus-galli Group with glabrous corymbs, 20 stamens and yellow anthers, in its thin leaves lobed on vigorous shoots, in its compact few-flowered corymbs and slender branchlets. In the shape of the thin leaves and in the lobing of these on vigorous shoots, and in its slender branchlets it resembles species of the Virides Group, but the numerous spines and the hard dry fruit seem to place it in the Crus-galli Group.

Crataegus subpilosa (§Crus-galli), n. sp.

Leaves broad-obovate, rounded at apex, gradually narrowed and cuneate at base, finely often doubly serrate to below the middle with straight or slightly incurved callous tipped teeth, slightly pilose on the upper side of the midrib early in the season, otherwise glabrous, thick, dark green and lustrous above, paler below, 4–6 cm. long and 2–3 cm. wide; petioles slender, wing-margined to below the middle, sparingly pilose in May, becoming glabrous, 5–8 mm. in length. Flowers appearing early in May, about 1.2 cm. in diameter, on slender pedicels in compact mostly 12–15-flowered corymbs, like the pedicels slightly pilose; calyx-tube narrow-obconic, glabrous, the lobes slender, long-acuminate, entire, glabrous on the outer surface, sparingly pubescent on the inner surface; stamens 20, anthers pale yellow, styles 2 or 3. Fruit ripening the end of September, in small drooping glabrous clusters, short-oblong to subglobose, dull orange-red, 8–10 mm. in diameter, with thin dry flesh; calyx little enlarged, with a narrow cavity pointed in the bottom; nutlets 2 or 3 narrowed at the rounded ends, ridged on the back with a narrow ridge, 7–8 mm. long and 4–5 mm. wide.

A tree 4.5–5 m. high, with a trunk 20 cm. in diameter, covered with pale gray scaly bark, wide-spreading branches forming a round-topped head and stout branchlets slightly pilose when they first appear, becoming glabrous, orange-brown or dark reddish brown in their second year, and armed with many stout straight purple spines 3.5–5 cm. in length, becoming compound and much elongated on the trunk and large branches.

ARKANSAS. Carroll County, rocky hillsides near Eureka Springs, *E. J. Palmer*, No. 4451 (3), September 23, 1913, No. 5520 (3), May 9, 1914 (type).

This species is most closely related to *Crataegus fera* Beadle of western Louisiana, from which it differs in its much broader and thicker leaves, without the hairs of that species on their upper surface early in the season, in its slightly pilose not densely villose corymbs and in the glabrous calyx-tube.

Crataegus transmississippiensis (§Molles), n. sp.

Leaves ovate to oval or elliptic, acute at apex, cuneate or occasionally rounded at base, finely double serrate usually to the base with acuminate callous tipped teeth, and slightly lobed above the middle with short triangular lobes; when they unfold coated above with short white hairs and densely tomentose below, and at maturity thin, glabrous above, slightly pubescent below on the slender midrib and primary veins, 5–6 cm. long and 3.5–4 cm. wide; petioles slender, densely tomentose when they first appear, becoming glabrous or puberulous 1.5–2.5 cm. in length. Flowers opening toward the end of April, in mostly 5–10-flowered small corymbs densely covered, like the pedicels and calyx-tubes, with long matted white hairs; calyx-lobes gradually narrowed from the base, slender, acuminate, laciniately glandular-serrate, villose, more densely on the outer than on the inner surface; stamens 10; anthers yellow; styles usually 3. Fruit ripening early in September, globose, scarlet, 1.5–1.7 cm. in diameter; nutlets usually 3, acute at base, broad and rounded at apex, 5 or 6 mm. long, 4–5 mm. wide.

A tree 6–7 m. tall, with a short trunk covered with furrowed bark, spreading branches forming a round-topped head, and stout branchlets thickly covered when they first appear with long matted white hairs, soon glabrous, dull reddish brown during their first season, becoming dark gray-brown and armed with occasional slender nearly straight spines 3–4 cm. in length.

ARKANSAS. Marion County, glades among rocks in open woods, *E. J. Palmer*, No. 8419 (6), September 1, 1915 (type), Baxter County, near Cotter, No. 17238 (6), April 18, 1920.

MISSOURI. McDonald County, Noel, *E. J. Palmer*, No. 4083, September 2, 1913; *B. F. Bush*, No. 7481, April 22, 1915; Stone County, near Galena, *E. J. Palmer*, No. 17236, April 18, 1920.

In the Molles Group the only species with leaves cuneate at base and flowers with 10 stamens and yellow anthers which has been described is *C. submollis* Sargent of eastern Canada and eastern Maine and Massa-

chusetts, which differs from this Missouri and Arkansas species in its larger more coarsely serrate leaves more deeply divided into acuminate lobes, in its broad many-flowered less densely villose corymbs and pyriform fruit.

Crataegus brachyphylla (§Molles), n. sp.

Leaves broad-ovate, acute or rounded at apex, truncate or rounded at the wide base, coarsely often doubly serrate with straight acuminate teeth, covered above when they unfold with short hairs and below with long matted white hairs persistent during the season, and at maturity thin, yellow-green and glabrous on the upper surface, 5–7 cm. long and 5–6 cm. wide, with a slender midrib and primary veins; petioles slender, thickly covered with matted white hairs early in the season, becoming glabrous or nearly glabrous before autumn, 2–3 cm. in length; leaves on vigorous shoots rounded at apex, cordate at the broad base, slightly and irregularly laterally lobed, coarsely doubly serrate and up to 6–8 cm. long and wide, with petioles 2–3 cm. in length. Flowers 1.5 cm. in diameter, appearing from the first to the tenth of April when the leaves are more than half grown, in small compact 5–8-flowered corymbs densely covered, like the slender pedicels and narrow obconic calyx-tube, with long matted snow white hairs; calyx-lobes narrow, long-acuminate, laciniately glandular-serrate, thickly covered with white hairs; stamens 20, anthers deep rose color. Fruit ripening early in September, on slightly villose pedicils, in erect clusters, subglobose, dull dark red, 10–12 mm. in diameter, with thin flesh, the calyx little enlarged, with a deep narrow cavity pointed in the bottom; nutlets usually 3, acute at base, rounded at the broader apex, only slightly ridged on the back, 6–7 mm. long and 3–4 mm. wide, the broad hypostyle extending to the middle.

A tree 6–7 m. high, with a trunk 15–18 cm. in diameter, spreading branches forming an open irregular head, and slender nearly straight branchlets thickly covered with white hairs when they first appear, nearly glabrous, bright red-brown and lustrous at the end of their first season and pale gray the following year, and armed with occasional straight or slightly curved spines 3–4 cm. long and often unarmed.

ARKANSAS. Hempstead County, dry gravelly ridges in the shade of open woods largely composed of *Quercus Durandii* Buckley and *Q. arkansana* Sargent about five miles northwest of Fulton, *C. S. Sargent*, April, 22, 1901; *B. F. Bush*, No. 151, April 23, 1901, No. 19A, April 26, 1905, No. 5933, October 4, 1909; *E. J. Palmer*, No. 7205 (21), April 12, 1915 (type), No. 3975 (21b), October 19, 1915, No. 9392 (21) and No. 10607 (21), April 8 and September 5, 1916, Nos. 16333 and 16340, September 9, 1919.

This is one of the most distinct species of the Molles Group, differing from the other described species in its comparatively small leaves without lobes except on vigorous shoots, small flowers in small few-flowered corymbs, and small fruit. It is unusual, too, to find a tree of this group growing on dry gravelly hills. In the shape of its leaves and their pubescence it resembles *C. lanuginosa* Sargent from southwestern Missouri,

but the leaves of that species are thicker, distinctly blue-green and usually slightly lobed, its flowers are larger and the calyx cavity of the larger fruit is broader and deeper. *C. lanuginosa* grows on rocky hillsides in open situations, and the branches of few species are furnished with such long and numerous spines.

Crataegus notha (*C. apiifolia* × *brachyphylla*), n. hyb.

Leaves broad-ovate, acute at apex, abruptly cuneate, rounded or truncate at base, coarsely and sharply doubly serrate usually only above the middle, and slightly and irregularly lobed, when they unfold thickly covered with matted white hairs, and at maturity thin, glabrous above, pubescent below, 3–4 cm. long and 2.5–3 cm. wide, with a thin midrib and slender primary veins occasionally running to the sinuses as well as to the points of the lobes; petioles slender, densely villose early in the season, becoming nearly glabrous, 1.5–3 cm. in length; leaves on vigorous shoots truncate or subcordate at base, more coarsely serrate, usually 3-lobed by deep narrow lateral lobes pointed in the bottom, and up to 5 cm. long and 5–6 cm. wide, with petioles usually about 2.5 cm. in length. Flowers appearing late in March, 1.5–1.7 cm. in diameter, on slender pedicels densely hoary-villose like the compact usually twelve to fifteen-flowered corymbs; calyx-tube narrow-obconic, densely villose, the lobes gradually narrowed from the base, acuminate, glandular, laciniately serrate, slightly villose; stamens 20, anthers deep rose color, styles 2–4. Fruit ripening the end of September, not abundant, on glabrous pedicels, ovoid, bright scarlet, 10 mm. long and 6–8 mm. wide, with soft succulent flesh, the calyx little enlarged with a deep narrow cavity pointed in the bottom; nutlets usually 4, acute at the ends, rounded and occasionally slightly ridged on the back, about 6 mm. long, 4 mm. wide.

A tree 6 or 7 m. high, with a trunk 15–20 cm. in diameter, covered with thin pale bark separating in small thin flake-like scales, stout spreading smooth pale gray branches forming an open irregular head, and slender slightly zigzag branchlets covered when they first appear with matted white hairs, becoming glabrous or nearly glabrous and reddish brown by the end of their first season and dull gray-brown the following year, and unarmed or armed with an occasional slender straight chestnut brown spine up to at least 4.5 cm. in length.

Arkansas. Hempstead County, dry gravelly hills about five miles northwest of Fulton, in open Oak-woods, *C. S. Sargent*, April 23, 1901; *B. F. Bush*, No. 154, April 23, 1901, No. 12, April 17, 1905, Nos. 12, 12A, 12B, March 26, 1909 (in flower); *E. J. Palmer*, No. 8974 (21 A), October 19, 1915, No. 9391 (21 A), No. 16333, September 9 1919, No. 20646, September 26, 1921 (type).

Mr. Palmer, who has watched this tree for several years, suggests that it is a hybrid between *C. apiifolia* Michaux and *C. brachyphylla* Sargent, both of which are growing with it. The bark of the trunk is that of *C. apiifolia* and the fact that a primary vein sometimes extends to the base of a sinus of a leaf, the character by which the Microcarpae Group

is best distinguished, also indicates its relationship with *C. apiifolia*. From that species it differs in its larger more pubescent only occasionally lobed leaves often cuneate at base in its more pubescent corymbs of larger flowers with a more pubescent calyx, and in its larger fruit. The pubescence of *C. notha*, although less dense is in character and persistency that of *C. brachyphylla;* the larger rarely lobed leaves, the larger flowers and fruit and the nearly unarmed branches may also be due to the influence of that species. Five individuals are now known, one a solitary tree and the other in a group. They all grow in the immediate vicinity of their supposed parents. If *C. notha* is a hybrid, and there seems to be good reason for the belief, it is a plant of unusual interest, showing as it would the possibility of crossing species of two as distinct groups of the genus as are now recognized. It would be, too, the only hybrid Crataegus which has been found in North America.

Crataegus brachycantha f. **leucocarpa,** n. forma.

Differing from the type only in the white or pale straw-colored fruit marked by dark dots.

LOUISIANA. Natchitches Parish, Natchitoches, *E. J. Palmer*, No. 8719 (12) September 28, 1915 (type).

Crataegus nuda (§Macracanthae), n. sp.

Leaves ovate to obovate, acute and often abruptly short-pointed at apex, gradually narrowed and cuneate at base, sharply and often doubly serrate often to below the middle, thin, glabrous, yellow-green above, paler below, 5–8 cm. long, 3–4 cm. wide, with a thin midrib and 6 or 7 pairs of slender primary veins; petioles slender, glabrous, slightly wing-margined, 1–1.5 cm. in length; leaves on vigorous shoots thicker, more coarsely serrate, to 7 or 8 cm. long and 4 cm. wide, with stouter petioles often winged to the base. Flowers appearing in the Arboretum in June (June 7, 1913, June 20, 1917), 1.5 cm. in diameter, on slender glabrous pedicels in wide compact many-flowered corymbs; calyx-tube narrow-obconic, glabrous, the lobes slender, long-acuminate, entire; stamens 10, anthers pale pink, soon white; styles 2. Fruit ripening the end of September, short-oblong to subglobose, bright red, about 1 cm. in diameter, with thin flesh; calyx little enlarged, with a comparatively wide deep cavity pointed in the bottom; nutlets 2, suborbicular, prominently ridged on the back, irregularly penetrated on the inner face by wide irregular depressions, 4 or 5 mm. long and broad, the narrow hypostyle extending to below the middle.

A tree 7 or 8 m. high, with slender nearly straight glabrous red-brown lustrous branchlets, becoming dark gray-brown and armed with numerous nearly straight slender spines 3–4.5 cm. in length.

MISSOURI. Taney County, woods near Swan, *C. S. Sargent*, October 1899 (type); *B. F. Bush*, No. 12A, September 25, 1905, Nos. 12 and 13, April 21 and May 16, 1907; Arnold Arboretum No. 4439 (Seed List 18), June 7 and October 9, 1913, June 20 and September 24, 1917, September 29, 1900, August 1, 1921.

This is the only glabrous species of the Macracanthae which has been found in the region west of the Mississippi River. Glabrous species in this group are not common anywhere and of them I have seen only *C. bristolensis* Sargent with ten stamens and rose-colored anthers and *C. Emersoniana* Sargent with ten stamens and yellow anthers, both from Bristol County, Massachusetts, and *C. venustula* Sargent from western New York and Ontario with ten stamens and yellow anthers. The other Macracanthae with glabrous corymbs have more or less hairy leaves or calyx-lobes villose on the inner surface.

(*To be continued*)

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE HERBARIUM AND THE COLLECTIONS OF THE ARNOLD ARBORETUM[2]

ALFRED REHDER

ROSACEAE (*continued*)

× **Rosa Barbierana,** nom. nov. (*R. multiflora* var. *cathayensis* "Crimson Rambler" × *Wichuraiana*). — *R. Wichuraiana rubra* André in Rev. Hort. 1900, 385; 1901, 20, t.

This handsome climbing Rose was raised by Barbier & fils, Orléans, France, from seeds of *R. Wichuraiana* fertilized by "Crimson Rambler"; it produces in great abundance single carmine flowers 3–4 cm. across.

× **Rosa Paulii,** nom. nov. (*R. arvensis* × *rugosa*). — *R. rugosa repens alba* Paul & Son apud F. in Gard. LIV. 279 (1910). — Darlington in Rose Annual, 1915, 43.

Shrub with long creeping or sarmentose stems densely covered with slender straight prickles and bristles; stem and prickles glabrous. Petioles and rhachis pubescent, sparingly prickly and glandular-bristly; stipules very large, sparingly glandular-ciliate; leaflets 5–7 on flowering branchlets, 7, rarely 9 on shoots, elliptic to obovate, 2–4 cm. long, acute or abruptly acute, coarsely serrate, glabrous, dark green and slightly rugose above, pale green beneath and pubescent on the veins and veinlets; stipules sparingly and minutely denticulate. Flowers white, about 7 cm. across in 5–12-flowered corymbs; peduncles densely prickly; pedicels densely covered with glandular bristles interspersed with a few slender prickles; receptacle glandular-bristly; sepals ovate-lanceolate, long-acuminate, usually entire, stipitate-glandular on the back; petals obovate, emarginate; styles exserted, free, glabrous.

[2] Continued from vol. II, p. 180.

This hybrid was raised by G. Paul & Sons of Cheshunt, England, and first distributed in 1903. It is a very vigorous shrub with large and showy white flowers; its long prostrate stems form in course of time an impenetrable bush to 6 feet high and of great width. The parentage of this Rose is usually given as *R. rugosa* Thunb. and *R. Wichurauana* Crépin, and without doubt it is a hybrid of *R. rugosa* with a trailing species of the Synstylae group, but in the texture of the leaves and their size and serrature and in the slight serration of the stipules it shows much more affinity to *R. arvensis* Huds. (*R. repens* Scop.) than to *R. Wichuraiana;* there is no trace of the small coriaceous lustrous leaves and the conspicuously dentate stipules in this hybrid. I, therefore, am inclined to consider the Rose known as *R. rugosa repens alba* a hybrid between *R. rugosa* and *R. arvensis* and it may bear the name of its raiser, George Paul, a name which figures so prominently in the history of the development of garden Roses.

The form with rose-colored flowers of apparently the same parentage may be known as **R. Paulii** f. **rosea**, comb. nov. (*R. rugosa repens rosea* Darlington in Rose Annual, 1915, 43).

The similar *R. Jacksonii* Willmott (*R. rugosa* × *Wichuraiana*) may be distinguished by its 7–9 smaller leaflets, lustrous above, less coarsely and almost crenate-serrate, and by the more densely and more deeply glandular-denticulate stipules.

× **Rosa Bruantii** nom. nov. (*R. odorata* [vel *R. dilecta*] × *rugosa*.) Upright shrub to 2 m.; branchlets glabrous, often slightly bloomy, armed with numerous straight prickles to 8 mm. long, passing into bristles. Leaves 5–7-foliolate; leaflets generally elliptic, 3–5 cm. long and 1.5–3 cm. broad, the terminal one often broadly obovate or ovate and to 3.5 cm. broad, acute or short-acuminate, broadly cuneate or sometimes, particularly the terminal leaflet, nearly rounded at base, rather closely and usually more or less doubly serrate, bright green, glabrous and nearly smooth above, grayish green and pubescent on the veins and veinlets beneath; petioles and rachis villose and armed with few straight or nearly straight unequal prickles; stipules rather narrow, doubly glandular-denticulate, ciliolate, with lanceolate or ovate-lanceolate upright or slightly spreading auricles. Flowers in usually 2–4-flowered corymbs, in the type white, fragrant, nearly double and 7–8 cm. across; pedicels slender, 3–5 cm. long, stipitate-glandular and bristly; ovary subglobose, glabrous; sepals ovate oblong, caudate, entire or sparingly serrulate at the elongated apex, sparingly stipitate glandular on the back, and finely villose toward the margin.

For the type of this hybrid group which is intermediate between *R. rugosa* Thunb. and the Tea Roses or Hybrid Tea Roses, I take "Madame Georges Bruant," raised by Bruant and offered to the trade in 1887, and

said to be a hybrid between *R. rugosa* and the Tea Rose "Sombreuil." The description given above is based on specimens collected June 20, 1921, and preserved in the herbarium of the Arnold Arboretum. Another Rose stated to be of the same origin is "Blanc Double de Coubert" (Cochet-Cochet, 1892). It will be in many cases difficult to draw a line between this group and *R. Arnoldiana* comprising the hybrids of *R. rugosa* and the Hybrid Perpetuals, as the Hybrid Perpetuals and the Hybrid Tea Roses are closely connected by intermediate forms, but it does not seem advisable to merge these two groups under one name. Another related group constitute the hybrids between *R. rugosa* and *R. chinensis*, the type of which is *R. calocarpa* Willmott, a single-flowered and freely fruiting plant.

× **Rosa anemonoides,** nom. nov. (*R. laevigata* × *odorata*).— "Anemonen-Rose" J. C. Schmidt apud Rehder in Möller's Deutsch. Gärtn.-Zeit. XI. 345, fig. (1896). — *Rosa laevigata* "Anémone Rose", Mottet in Rev. Hort. 1901, 549, tab. — *R. sinica* "Anemone" P. in Gard. LXII. 413, fig. (1902). — Gard. LXXVII. 340, fig. (1913); LXXX. 309, fig. (1916). — *R. laevigata* var. "Rose-Anemone" Easlee, Fl. & Sylva, III. 218, fig. (1905). — *Rosa laevigata* × *chinensis* "Rose Anemone" Willmott, Gen. Rosa, 121, tab. (1911).

This hybrid which was raised by I. C. Schmidt of Erfurt, sometime before 1896 from seed of *R. laevigata* Michx. resembles in its general characters its parent and was considered by Mottet only a variety of *R. laevigata*, but its larger pink flowers, the occasional occurrence of 5-foliolate leaves, the less bristly receptacle, the exserted styles and particularly the stipules adnate about one half of their length to the petiole show the influence of some other Rose which was to all appearances a Tea or a Hybrid Tea Rose; the somewhat exserted styles, the shape of the stipules and the texture, shape and serration of leaflets indicate the influence of *R. odorata* Sweet.

× **Rosa dilecta,** nom. nov. (*R. odorata* × *borboniana*). — "Hybrid Tea scented Roses" Paul, Rose Garden, ed. 9, 303 (1888). — "Thee Hybrid-Rosen," Schultheiss, Deutsch. Rosenbuch, 147 (1889). — "Tea Hybrids" Barron in Bailey, Cycl. Am. Hort. IV. 1563 (1902). — "Roses Hybrides de Thé" Cochet-Cochet, Rosiers, 166 (1897). — Gravereaux, Ros. l'Hay, 84 (1902). — Hybrid Tea Rose" Pemberton, Rose, 88 (1908).

The forms of this group, the type of which may be considered "La France," are intermediate in their characters between the Tea Rose, *R. odorata* Sweet and the Hybrid Perpetuals which belong to *R. borboniana* Desp. They are slender-branched, sometimes sarmentose shrubs; the stems armed with scattered straight or slightly hooked prickles. The leaves are glabrous and of firm texture, often purplish when unfolding. The flowers are usually solitary or in few-flowered corymbs, white to red, or sometimes yellow, fragrant and when opening are of a distinct conical shape with recurving petals.

As this group of hybrids has not yet received a binomial designation, I propose the name *R. dilecta*, meaning the beloved or highly esteemed, since such universal favorites as "American Beauty" and "La France" belong in this group.

Rosa Richardii, nom. nov. — *Rosa sancta* A. Richard, Fl. Abyss. I. 262 (1847), non Andrews.

The name *R. sancta* given by Richard to this Abyssiniana Rose is unfortunately antedated by *R. sancta* Andrews, Roses, II. t. 98 (1928) and cannot be retained. The exact systematic position of Andrew's *R. sancta* is not clear; it bears some resemblance to *R. chinensis* var. *minima* Rehd. (*R. Lawrenceana* Sweet), as Miss Willmott (Gen. Rosa II. 338) points out, but the slender infrastipular paired prickles and the stipitate-glandular pedicels suggest relation to the Cinnamomeae.

× **Rosa Waitziana** Tratt. var. **macrantha,** comb. nov. — *R. macrantha* Desportes, Fl. Sarthe, 77 (1838). — Grenier & Godron, Fl. France, I. 553 (1848). — Boreau, Fl. Cent. France, ed. 3, II. 227 (1857). — A. Piper in Gard. LII. 465 t. fig. 1. — Rouy & Camus, Fl. de France, VI. 270 (1900). — Mottet in Rev. Hort. 1901, 548, t. fig. 2. — Willmott, Gen. Rosa, II. 403 (1912). — Bean, Trees, Shrubs Brit. Isls. II. 418 (1914). — *R. gallica* var. *macrantha* Hort. apud Rehder in Bailey, Cycl. Am. Hort. IV. 1552 (1902); Stand. Cycl. Hort. V. 2989 (1916).

This hybrid Rose which is undoubtedly a hybrid between *R. canina* and *R. gallica* and was first described as *Rosa macrantha* must be referred according to the Rules as a variety to *R. Waitziana* Trattinick, not Reichenbach the oldest binomial designation for a hybrid between *R. canina* and *R. gallica.*

Rosa arnoldiana, Sargent in Bull. Pop. Inform. Arnold Arb. n. ser. v. 38 (1919) (*R. rugosa* × *borboniana* "Général Jacqueminot"). — Gersdorff in Am. Rose Ann. 1919. 136. — *Rosa* "Arnold" in Am. Rose Ann. 1916, 125. — *Rosa* "Dawson's Hybrid Rugosa" Gersdorff in Am. Rose Ann. 1917, 121.

Shrub with stout upright stems; shoots and flowering branchlets covered with slender prickles and bristles, the prickles gradually passing into short glandtipped bristles and stipitate glands; the young stems sparingly pubescent or nearly glabrous. Leaves 5–7-foliolate; leaflets elliptic-ovate or broadly elliptic, 3.5–6 cm. long, short-acuminate or rounded at apex, rounded at base, simply or slightly doubly serrate, dark green and slightly rugose above, grayish green beneath and finely pubescent on the veins and sparingly so on the veinlets; petiole and rachis pubescent and stipitate-glandular and sparingly furnished with small often gland-tipped prickles; stipules broad, sparingly glandular ciliate. Flowers bright amaranth-purple, semi-double about 6 cm. across in few-flowered corymbs; bracts large; pedicels densely stipitate-glandular; sepals ovate-lanceolate, long-acuminate, entire, very rarely with a single

lobe, pubescent and stipitate-glandular on back, reflexed after anthesis, later spreading; receptacle subglobose or broadly pyriform, smooth; petals orbicular-obovate.

Cultivated at the Arnold Arboretum under No. 6582; specimens collected June 21, 1916, and June 12, 1921, (type) are preserved in the herbarium of the Arnold Arboretum.

This hybrid was raised at the Arnold Arboretum by Jackson Dawson in 1914 by fertilizing *R. rugosa* with "Général Jacqueminot." It is a very striking Rose on account of the deep red color of the large flower and has proved perfectly hardy at the Arnold Arboretum.

There seems to be no older available binomial for the hybrids between *R. rugosa* and the different forms of the Hybrid Perpetuals to which "Général Jacqueminot" belongs and which may be classed under *R. borboniana* Desp.,[3] though hybrids of similar origin have been raised by G. G. Paul and others. Thus the name *R. arnoldiana* may stand as the binomial designation for the hybrids between *R. rugosa* and the "Hybrid Perpetuals."

Rosa virginiana var. **lamprophylla**, var. nov.

A typo recedit foliolis basi manifeste cuneatis ellipticis vel obovato-ellipticis, rarius obovatis, apice acutis vel interdum rotundatis, glabris, lucidissimis, breviter petiolulatis, foliis turionum 9-foliolatis.

[3] *Rosa borboniana* Desportes, Ros. Gall 106 (1828).—Morren in Ann. Soc. Agric. Bot. Gand II. 11, t. 42 (1846).—Gravereaux, Ros. L'Hay, 27 (1902).—*R. canina Burboniana* Thory in Redouté, Roses, III. 105, t. (1824); ed. 3, III. gr. 20, 3, t. (1835).—*R. indica β. borbonica* Hort. apud K. Koch, Hort. Dendr. 122 (1853), nomen. - Regel in Act. Hort. Petrop. V. 358 (Tent. Monog. Ros. 74) 1878), syn. nonnull. exclud.—*R. chinensis* b. *borbonica* Dippel, Handb. Laubholzk. II. 563 (1893), syn. nonnull. exclud.—*R. Borbonica* Mouillefert, Arb. Arbriss. I. 558 (1893).—Rehder in Bailey, Cycl. Am. Hort. IV. 1551 (1902); Stand. Cycl. Hort. V. 2988 (1916).—Willmott, Gen. Rosa II. 339, t. (1912).—*R. gallica* var. *damascena* Voss, Vilmorin's Blumengaert. I. 254 (1894), pro parte.

The typical *R. borboniana* was introduced about 1819 from the Island of Bourbon to France and is considered a hybrid of *R. chinensis* var. *semperflorens* and a form on *R. gallica*. From this cross the hybrid Bourbon Roses and later the Hybrid Perpetuals have been derived which likewise are chiefly hybrids between forms of *R chinensis* and forms of the Gallicae group. As these groups of hybrids originated from the same species as the original Bourbon Rose or from closely related species and no definite line can be drawn between these groups, it seems best to use *R. borboniana* as the binomial designation for the whole group of hybrids of *R. chinensis* (possibly with some admixture of *R. odorata*)with the species and forms of the Gallicae group.

Rosa borboniana Desp. must not be confused with *R. Bourbonia* Roessig (Oek.-bot. Beschreib. Ros. II. 28 [1803].—*R. formosa* Roessig, Ros. no. 50, t. [1804?].—*R. gallica Burboniana* Thory in Redouté, Ros. I. 74 [1817]); this is a form of *R. gallica* in Roessig's time much cultivated in France, and judging by Roessig's description and colored plate similar in appearance to *R. borboniana*, but it differs chiefly in the short straight spines of the glandular stem, in the doubly serrate, fragrant, ovate leaflets, in the doubly lobed sepals and the densely red-glandular receptacle. The name *R. Bourbonia* Roessig can hardly be considered a homonym invalidating the later *R. borboniana*, as the spelling and the derivation is different; the name "Bourbonia" being a personal name derived from the house of Bourbon, while "borboniana" is a geographical designation referring to the Island of Bourbon, where the plant originated.

Cultivated at the Arnold Arboretum under No. 1579 (sent from Mt. Desert Island, Maine, in 1881 by Professor R. T. Jackson); specimens collected June 26 and September 29, 1902 (No. 3) and September 16, 1921 (No. 1579, type) preserved in the herbarium of the Arnold Arboretum. The following specimens though not typical, are also referable to this variety: Maine: Mt. Desert Island, Somersville, September 21, 1892, *M. L. Fernald* (a somewhat abnormal form with deeply incised-serrate leaflets); Moore's Harbor, Isle Au Haute, Knox County, August 21, 1913, *A. F. Hill* (No. 1150); South Poland, Androscoggin County, 1895, *Kate Furbish* (partly). (All from the herbarium of the New England Botanical Club). Massachusetts: Jamaica Plain, Well's Farm, July 12, 1902, *A. Rehder*. Connecticut, Southington, Sept. 2, 1902, *C. S. Sargent*.

The living plants of this variety look quite distinct from the typical form of *P. virginiana* on account of its very lustrous, dark green leaves and dense habit; it forms wide dense clumps, with upright stems to 1 m. tall but usually lower, the branches are spreading and often more or less pendant and the outer shorter stems of the clump often procumbent; sometimes all the stems are low and their spreading slender branches procumbent. The leaves of the shoots are usually 9-foliolate, those of the flowering branchlets 7-foliolate or sometimes 9-foliolate; the leaflets are elliptic or narrow-elliptic to elliptic-obovate or obovate, distinctly cuneate at the base, acute or sometimes rounded at the apex, 1.5–3.5 cm. long, sharply serrate with often slightly incurved teeth, glabrous or sometimes slightly pubescent on the midrib beneath; rachis usually with few small prickles and sometimes slightly pubescent. The flowering branchlets are not bristly and sometimes without prickles.

As an ornamental plant it is very handsome on account of its dens rather spreading habit, its dark green leaves, their color in pleasing contrast to the red petioles and branchlets; the large pink flowers and the ornamental red hips in autumn are not different from those of the typical form.

Rosa carolina var. **glandulosa**, comb. nov. — *R. serrulata* Rafinesque in Ann. Gén. Sci. Phys. v. 218 (1820). — Rydberg in N. Am. Fl. XXII. 500 (1918). — *R. parviflora* var. *β. glandulosa* Crépin in Bull. Soc. Bot. Belg. XV. 68 (1876). — *R. parviflora* var. *δ setigera* Crepin, l. c. (1876), ? in part. — *R. mexicana* S. Watson in Proc. Am. Acad. XVII. 354 (1882), not Willdenow.

SPECIMENS EXAMINED: Pennsylvania: Mountain Park, Luzerne County, July 4, 1907, *A. Twining* (No. 10). District of Columbia: Takoma Park, June 3, 1899, *T. A. Williams*. Virginia: Natural Bridge, Rockbridge County, September 16, 1888, *C. S. Sargent;* near Suffolk, Nansemond County, August 21, 1908, *A. Rehder*. West Virginia: near Durbin, Pocahontas County, August 26, 1907, *A. Rehder;* near White Sulphur Springs, Greenbrier County, August 31, 1907, *A.*

Rehder. North Carolina: Buncombe County, October 29, 1906, *T. G. Harbison.* Tennessee: Nashville, Davidson County, October, 1879, *A. Gattinger;* Memphis, Shelby County, May 15, 1920, *E. J. Palmer* (No. 17512). Alabama: Selma, Dallas County, May 5, 1913, *T. G. Harbison* (No. 1099). All in herb. Arnold Arboretum.

This variety differs from the type in its more or less doubly serrate leaflets, their teeth provided at least partly with one or few gland-tipped small teeth or glandular-ciliate, and in its glandular-hispid or stipitate-glandular rachis. I can see no other difference between this variety and the type with which it is closely connected by intermediate forms. Therefore I cannot consider it specifically distinct, as does Rydberg. He lays much stress on the teeth being gland-tipped on *R. serrulata* in which he includes also forms with simply serrate leaflets, and glandless in *R. carolina*, but I find the teeth in *R. serrulata* as well as in *R. virginiana* and *R. carolina* tipped by a callous more or less gland-like mucro, not by a distinct gland; distinct stipitate glands occur only on the minute serratures of the teeth of the leaflets of the var. *glandulosa* and also on the minute teeth at the base of these leaflets. To var. *glandulosa* belongs probably, at least partly, Crepin's *R. parviflora* var. *setigera* with bristly flowering branchlets, though it may be partly referable to *R. subserrulata* of Rydb., which may be likewise only a variety of *R. carolina.*

According to Rydberg *R. serrulata* Raf. is distributed from Massachusetts to Ontario, Iowa, Texas and Florida and extends into Mexico as far as Coahuila and Nueva Leon.

Rosa Lyonii Pursh. f. **alba**, comb. nov. — *R. lucida* var. *alba* in Am. Florist, XII, 1098, fig. (1897); in Gardening, v. 306, fig. (1897). — Rehder in Bailey, Cycl. Am. Hort. IV. 1554 (1902); in Möller's Deutsch. Gärtn. - Zeit. XIX. 205, fig. (1904). — *R. virginiana alba* Willmott, Gen. Rosa, I. tab. opp. p. 198 (1911).—Bean, Trees & Shrubs, Brit. Isls. II. 447 (1914), as var. — Rehder in Bailey, Stand. Cycl. Hort. v. 2991 (1916), as var.

This white-flowered form which had been referred to *R. virginiana* Mill. belongs apparently to *R. Lyonii* Nutt., as the petioles, rachis and the under side of the leaves are pubescent, the leaflets are obovate to elliptic or narrow-elliptic, usually obtuse, rarely acute, and dull green above; the prickles are rather small, slender and straight. The form was found at Cherryfield, Maine, about 1867.

Rosa suffulta Greene f. **alba**, n. comb. — *R. pratincola* f. *alba* Rehd. in Mitt. Deutsch. Dendr. Ges. XIX. 252 (1910). — *R. arkansoides* f. alba Schneider, Ill. Handb. Laubholzk. II, 971 (1911). — *R. heliophila* f. *alba* Rehder in Mitt. Deutsch. Dendr. Ges. XXIV (1915), 222 (1916).

A form with white flowers received in 1901 from Professor S. B. Green of the University of Minnesota, St. Anthony Park, Minnesota.

Rosa californica Cham. & Schlecht. f. **plena,** nom. nov. — *R. californica* Willmott, Gen. Rosa, I. t. opp. 233 (1911). — *R. californica flore pleno* Bean, Trees & Shrubs, Brit. Isles, I. 421 (1914).

A form with double or semidouble flowers.

Rosa Penzanceana, nom. nov. (*R. Eglanteria* × *foetida punicea*). — *R. rubiginosa* × *lutea punicea* (Rose Penzance) Crépin in Jour. des Ros. 1891, 123; in Gard. Chron. ser. 3, IX, 671 (1891). — *R. lutea* × *rubiginosa* Crépin in Bull. Soc. Bot. Belg XXXIII. 124 (1894). — *R. rubiginosa* × *lutea* Keller in Ascherson & Graebner, Syn. Mitteleur. Fl. VI. 348 (1902).— *R. Eglanteria* × *punicea* Willmott, Gen. Ros. II. 455 (1912).

This hybrid, called the "Lady Penzance Rose," was raised by Lord Penzance about 1894 from a cross between the Sweet Briar and the Austrian Briar. It has the fragrant leaves of *R. Eglanteria* L. and pink flowers suffused with yellow. A full description of this hybrid is given in Miss Willmott's book cited above.

× **Prunus Dunbarii,** hybr. nov. (*P. americana* × *maritima*).

Much-branched shrub or tree to 5 m. tall, with broad spreading head; spreading by suckers; young branchlets pubescent, at maturity nearly glabrous and red-brown, becoming dark brown the second year; winter-buds ovoid, acutish, light brown, puberulous or nearly glabrous. Leaves elliptic-oblong or sometimes oblong-obovate, 4.5–9.5 cm. long and 1.8–5 cm. broad, abruptly acuminate, rounded to cuneate at base, sharply serrate with acuminulate teeth, glabrous above except on the midrib or very sparingly hairy, pubescent beneath on the midrib and less densely so or sometimes glabrescent on the veins and veinlets; petioles 0.5–1 cm. long, densely short-pubescent. Flowers 2–4, white, about 1.5 cm. across; pedicels 5–8 mm. long, minutely pubescent toward the apex or nearly glabrous; sepals oblong, obtuse, as long or slightly longer than the tube, entire, finely pubescent outside, villose inside, petals obovate, about 7 mm. long, with a long claw; stamens about as long as petals. Fruit subglobose, purple, slightly bloomy, 1.7–2 cm. across, on slender stalks about 1.5 cm. long; stone broadly ovoid, compressed, sharply keeled on one side, 1.3–1.5 cm. high and 1.2 cm. wide, smooth.

Cultivated in Genesee Valley Park (old Frost Nursery) and Highland Park, Rochester, New York. Specimens in herb. Arnold Arboretum: Genesee Valley Park, April 24, 1921, *B. N. Slavin* and April 25 and August 15, 1921, *J. Dunbar & R. E. Horsey,* (Edson No. 0-1154, type); Highland Park, April 25, 1921 and October 9, 1920, *J. Dunbar & L. G. Edson* (Edson No. 0-1152). Photograph of the tree in Genesee Valley Park taken by R. E. Morsey in the photograph collection of the Arnold Arboretum.

This hybrid originated about 22 years ago from seed of *P. maritima* collected by Mr. John Dunbar in Highland Park. The tree in Genesee Valley Park is now nearly 5 m. tall with a short trunk about 0.3 m. high

and 0.25 m. in diam. and with a spreading round head about 7 m. in diameter. There is no doubt that the other parent of the hybrid is *P. americana* Marsh. which was standing near the parent tree, as it is clearly intermediate between the two. From *P. americana* it differs chiefly in its lower more shrubby habit, in its pubescent branchlets, in its somewhat broader more finely serrate leaves, more or less pubescent beneath, in the shorter pubescent petioles, in the smaller purple fruit and smaller stone. From *P. maritima* Wangh. it may be distinguished by the branchlets being glabrous at maturity, by the larger acuminate more deeply and sharply serrate leaves, glabrous or nearly so above, less densely pubescent beneath, by the glabrescent pedicels and calyx-tube, longer sepals, larger purple fruit and larger more compressed stone. From *P. lanata* Mack. & Bush with which it may be confused on account of the pubescent leaves it can be distinguished by the more finely serrate leaves, shorter petioles, and shorter pedicels on the smaller purple fruit.

The two trees of this hybrid differ considerably in their leaves; the tree in Genesee Valley Park (No. 1154) has somewhat larger and broader more or less ovate leaves rounded at the base, more rugose and with a few scattered hairs above, hairy on the midrib, veins and veinlets beneath; the tree in Highland Park has smaller leaves, often more or less obovate in outline, 8 cm. long and 3.5 cm. wide, broadly cuneate at base, quite glabrous above, beneath only densely hairy on the midrib, glabrous or glabrescent on the veins and veinlets, and shorter petioles not exceeding 8 mm. in length.

As an ornamental, this hybrid plant seems to surpass when in bloom both parents in beauty, judging from the photograph of the tree in Genesee Valley Park.

Prunus mume Sieb. & Zucc. var. **tonsa**, var. nov.—*Prunus mume* Koehne in Sargent, Pl. Wilson 1, 278 (1912), non Sieb. & Zucc.

A typo recedit foliis tantum subtus ad costam vel secus costam basin versus villosis et in axillis nervorum inferiorum barbatis ceterum glabris vel fere omnino glabris plerisque angustioribus quam in typo, basi saepe late cuneatis.

China. Western Szechuan: west and near Wen-chuan Hsien, thickets, alt. 1300–2500 m., September, 1908, *E. H. Wilson* (No. 1018). type; alt. 16–2000 m., October, 1910, *E. H. Wilson* (No. 4046). Southern Szechuan: between Kalapa and Linki, alt. 3200 m., May 17, 1914, *C. Schneider* (No. 1285); near Woloho, alt. 2600–2800 m., June 14 and 15, 1914, *C. Schneider* (Nos. 1546, 1574). *Western Hupeh*: Ichang, wild and cultivated, alt. 300–1000 m., March and September, 1907, *E. H. Wilson* (No. 75). Chekiaug: near Changhua, July 10, 1915, *F. N. Meyer* (No. 1538). Kwangtung vicinity of Canton, December, 1917, and April, 1918, *C. O. Levine* (Nos. 1886 and 2113). Kiangsu: near Nanking, garden of temple in Spirit Valley, June 4, 1915, *F. N. Meyer* (No. 1426).

FORMOSA. Around Musha, prov. Nante, wild, March 4, 1918, *E. H. Wilson* (No. 10010; bush up to 30 ft.).

CULTIVATED. "In the Woods," Chevey Chase, Maryland, June 15, 1920 (Nos. 526 and 521), June 15, 1920 and March 27, 1921 (Nos. 522, 523, 528), *P. F. Newhall.* U .S. Plant Introduction Station, Chico, Calif., January 26 and August 11, 1921 (S. P. I. No. 41061; from Yokohama Nursery Company), February 8 and June 23, 1921 (S. P. I. No. 41455; from Tsaochowfu, Shantung, cultivated by the Chinese for forcing purposes), January 26 and June 8, 1921 (S. P. I. No. 28685; from Yokohama Nursery Company); January 26 and June 23, 1921 (S. P. I. No. 26886; from Dongsi, China), *C. C. Thomas.* Municipal Park, Zaukadoo, Shanghai, April and May, 1917, *L. H. Bailey* (Herb. L. H. Bailey).

Numerous specimens received lately from the Department of Agriculture at Washington from trees cultivated at Mr. David Fairchild's place "In the Woods," Chevey Chase, Maryland, and at Chico, California show at the first glance a marked difference in the pubescence of the leaves; in some the leaves are pubescent on both sides, while in the others they are quite or nearly glabrous except near the base of the midrib beneath and at the same time are generally narrower, inclined to be broad-cuneate at base, and their color is more grayish green as compared with the distinctly yellowish green color of the pubescent form. The latter should be considered the typical form of the species, as Siebold & Zuccarini describe the leaves as "novella utrinque, adulta praesertim subtus pilis rigidis venis impositis pubescenti-scabra et saepius ibidem in inferiore nervi medii parte lana brevi (sicca) fuscescente barbata," though in the diagnosis of the species he says "foliis . . . glabris vel praesertim subtus pubescenti-scabris." In the flowers and in the fruit there is apparently no difference between the two varieties. The glabrous form seems to be widely distributed in China, as appears from the enumeration of specimens above, while of the pubescent form I have seen only one specimen from north Kiangsu, collected by Joseph Hers near Siao Hsien, May 28, 1919 (No. 1046) and two from Honan, collected by L. H. Bailey on Chikungshan, June 14 and 30, 1917. The only Formosan specimen I have seen (E. H. Wilson, No. 10010) differs from the Chinese glabrous variety in the narrower more caudately acuminate leaves and may be a different form.

Besides this variety and the type (*Prunus mume* α *typica* Maximowicz in Bull. Acad. Sci. St. Pétersb. XXIX. 84 (1883); in Mél. Biol. XI. 672 (1883).—*P. Myrobalana fl. roseis* Hort. gall. ex Kew Hand-list I, 133 (1894) several varieties and forms are in cultivation, as *P. mume* var. *albo-plena* Bailey, var. *pendula* Nichols., var. *pleiocarpa* Maxim., var. *Goethartiana* Koehne, var. *bungo* Makino, and *Armeniaca mume* var. *alba* and var. *Alphandi* Carrière. *Armeniaca mume* var. *alba* Carrière may possibly be the same as var. *tonsa* described above, but as Carrière does not say anything about the pubescence or lack of pubescence of this

form, we have to assume that it agrees with the type and represents a form identical with a specimen from a plant cultivated at Chico under the P. O. G. No. 16003 and with several specimens received from "In the Woods" Chevy Chase, Md., under Nos. 520, 524, 531, 532 and 533, which have pubescent leaves and white flowers. I therefore propose to use the name *P. mume* f. **alba**, n. comb. (*Armeniaca mume* var. *alba* Carrière in Rev. Hort. 1885, fig. 102 [p. 564], 566) for this form. For the double-flowered pink form the oldest valid and available varietal name seems to be *P. mume* f. **Alphandii**, n. comb. (*Armeniaca mume* var. *Alphandii* Carrière, l. c. 564, tab.). There seem to be also forms of var. *tonsa* with double pink flowers, as a specimen collected in the Municipal Park, Zaukadoo, Shanghai, by Professor L. H. Bailey on April 1 and May 20, 1917 (Herb. L. H. Bailey) shows. More and complete material, however, of the various forms is needed, before we can attempt their exact classification.

Prunus kansuensis (subgen. Amygdalus), sp. nov.

Frutex altus erectus ramis virgatis; gemmae parvae fusco-brunneae perulis ovatis mucronulatis nitidulis glabris albo-ciliolatis; ramuli hornotini graciles, glabri, virides vel purpurascentes, annotini brunnei, pallide punctulatis. Folia oblongo-lanceolata vel lanceolata, 7–12 cm. longa et 1.5–3.5 lata, infra medium latissima, longe acuminata, basi cuneata et in petiolum decurrentia, adpresse serrata dentibus obtusiusculis glanduloso-mucronulatis, inferiora minora interdum grossius serrata dentibus plus minusve patentibus, supra laete luteo-viridia, glabra, subtus paullo pallidiora, secus costam basin versus villosa et interdum ad venas sparsissime villosa; nervis in foliis turionum utrinsecus 8–12 subtus elevatis, reticulo nervulorum fere obsoleto; petioli sursum marginati, glabri, in turionibus plerique 5 mm. longi, ei foliorum fasciculatorum 3–8 mm. longi, apice eglandulosi, rarius glandulis imperfectis notati. Flores in axillis bini, ex utraque gemma solitarii, subsessilia; calyx purpurascens; sepala anguste ovalia, 4–4.5 mm. longa et 2.5–3 mm. lata, tubum late campanulatum utrinque glabrum paullo superantia, intus glabra, extus laxe languinoso-villosa; petala alba vel albida, ovalia, 1.2–1.4 cm. longa et 7.5–9 mm. lata, apice obtusa, basi late cuneata et in unguiculum brevissimum contracta; stamina 25–30, 0.4–1 cm. longa, longiora petalis circiter triente breviora; antherae late ovalia, circiter 1 mm. longae; stylus ad medium vel ultra longe villosus, ovario incluso 1.4–1.7 cm. longus, petala paulla superantia vel subaequantia. Drupa subglobosa, dense velutina, vix edulis; putamen oblique ellipsoideum v. obovoideo-ellipsoideum, 2 cm. longum et 1.3–1.5 cm. latum, leviter compressum, 1.1–1.4 cm. crassum, utrinque carinatum, apice brevissime apiculatum, basi sulcis satis profundis longitudinalibus sursum curvatis et plus minusve anastomosantibus.

CHINA. Kansu: Kagoba, south of Hsiku, Oct. 3, 1914, *F. N. Meyer* (No. 2142a, seed only); plants raised from this seed cultivated under No. 40004 at the Plant Introduction Station at Chico, Calif. Specimens examined: Chico, February 10, and August 11, 1921, *C. C. Thomas.* Here belong also specimens collected at the same date from plants cultivated under No. 40001 and raised from seeds collected by F. N. Meyer at Sianfu, Shensi, where it is cultivated and said to have come from near Tzewu, south of Sianfu.

This new species is most closely related to *Prunus Persica* Stokes which differs chiefly in its more finely serrate leaves (with usually 5–10 teeth to 1 cm.; while in *P. kansuensis* there are usually 3–5 teeth to 1 cm.) more abruptly contracted at base with usually two conspicuous glands at the apex of the petiole, in the pubescent winter-buds, in the shorter style, as long or usually shorter than the longest stamens, and in the usually larger, pitted and deeply grooved stone with narrow and irregular grooves, while in *P. kansuensis* the stone is not pitted and the grooves are wider and shallower and fairly regular and parallel in the lower half of the stone. The color of the flowers of the new Peach is shell-pink according to Meyer, but in the cultivated specimens before me it is white with only a slight trace of pink in the young bud.

Prunus kansuensis shows such a close resemblance and affinity to *P. Persica* that I would have referred it as a variety to that species, if it had not been for the long style and the differently sculptured stone which is not at all pitted and which has shallower more regular grooves. In *P. Persica* and the related species the style is always shorter or at most as long as the longest stamens. The stone in *P. Persica*, *P. communis* Arcang. and *P. Davidiana* Franch. is deeply pitted and the grooves are deep and narrow and very irregular, while in *P. mira* Koehne it is nearly smooth, in *P. tangutica* Koehne the stone is grooved and not pitted but this and allied species differ markedly in their spiny branches and much smaller leaves. I find, however, the stone of Wilson's No. 611 from Fang Hsien in Hupeh only slightly pitted and that of Schneider's No. 3190 from Lichiang and Yunnan not pitted and very similar to the stone of *P. kansuensis*, but in the leaves they agree with typical *P. Persica* to which they have been referred; more complete material is needed to decide if these forms should remain with *P. Persica*.

As the collector's field notes to the two numbers on which this new species is founded, give much additional information they may be reprinted here from the Inventory of seeds and plants imported by the Office of foreign seed and plant introduction (U. S. Dept. Agric.). No. 42, 50 (1918):

"40001. (No. 2139a. Sianfu, Shensi, China. August 30, 1914) Wild peaches having larger fruits than the ordinary wild ones, said to come from near Tzewu, to the south of Sianfu, but some also probably collected from trees in gardens which were raised from wild seeds. When seen

wild this peach generally assumes a low bush form of spreading habit; when planted in gardens and attended to, it grows into a small tree, reaching a height of 12 to 20 feet, with a smooth trunk of dark mahogany-brown color. The leaves are always much smaller and more slender than in cultivated varieties, while their color is much darker green. They seem to be somewhat less subject to various diseases than the cultivated sorts, and they are most prolific bearers, although the fruit is of very little value, on account of its smallness and lack of flavor. In gardens around Sianfu this wild peach is utilized as a stock for improved varieties It is also grown as an ornamental; said to be literally covered in spring with multitudes of shell-pink flowers. See also No. 2123a (S. P. I. No. 39428)."

"40004. (No. 2143a. Kagoba (south of Ksiku, Kansu, China, October 3, 1914.) Wild peaches occurring as tall shrubs in loess cliffs at the Tibetan frontier at altitudes of 6,000 to 8,000 feet. Save for some children who eat these wild peaches, they are otherwise considered worthless wild fruit. Local name Yeh t'ao, meaning "wild peach" and Mao t'ao, meaning "hairy peach".

Prunus mira Koehne in Sargent, Pl. Wilson. 1. 272 (1912).—Description adde: Flores praecoces, solitarii, subsessiles; calycis tubus rubescens, basi vel interdum ad medium vel ultra perulis latis margine villosis obtectus, late campanulatus, 4.5–5 mm. longus et circiter 5 mm. latus, extus intusque glaber; sepala rubescentia, anguste ovalia, circiter 5 mm. longa et 3 mm. lata, margine albo-villosula excepta utrinque glabra, tubum subaequantia, demum reflexa; petala alba, suborbicularia, 10–13 mm. longa et lata, apice rotundata vel emarginata, basi in unguiculum 1 mm. longum subito contractum; stamina 45–50, inaequalia, 4–8 mm. longa, longiora petalis circiter triente breviora, filamentis glabris, antheris ovalibus flavis 1.5 mm. longis; ovarium dense villosum; stylus cum ovario 9–10 mm. longus, sepala subaequans, staminibus brevior, triente superiore excepto dense villosus.

The flowers of this species were not known when Koehne described it from a specimen collected by Wilson in western Szech'uan under No. 4205. From seed of this number plants have been raised; they, however, did not prove hardy in this Arboretum, but have flowered since in other gardens where plants had been sent from here. In 1917 a small flowering branch was sent by Mr. L. Barron, Garden City, New York, and this year we received through the Department of Agriculture from the Plant Introduction Garden in Chico, Calif., good flowering material on which the description given above is based. It flowered there on March 1st well before the leaves, while the flowering specimens from Garden City was collected on May 15th with the young leaves developing, the single flower was already loosing its petals and borne on a pedicel about 4 mm. long, but I suspect normally the species flowers before the leaf-buds open.

Prunus dehiscens Koehne in Sargent Pl. Wilson. I. 271 (1921); III. 432 (1917).—Descriptioni adde: Flores praecoces, solitarii, subsessiles; calycis tubus rubescens basi perulis glabris obtectus, late campanulatus, 4–5 mm. longus et circiter 5 mm. latus, extus glaber, intus sparse papilloso-pilosus pilis in seriebus irregularibus longitudinalibus dispositis; sepala rubescentia, ovalia, 3.5–4 mm. longa et 3 mm. lata, apice rotundata, integra, glaberrima, demum reflexa, tubo paullo breviore; petala alba, obovata, 11–12 mm. longa et 7–8 mm. lata, apice rotundata, basi lata cuneata et vix unguiculata; staminia circiter 30 (30–33 visa), inaequalia, 3–6 mm. longa, petala dimidia aequantia, filamentis glabris, antheris ovalibus 1.25 mm. longis flavis; ovarium dense breviter pilosum; stylus cum ovario 9–11 mm. longus, papilloso-pilosus vel breviter pilosus triente superiore glabro excepto, stamina aequans vel paullo superans.

When this species was described by Koehne only fruiting specimens collected by Wilson in western Szech'uan under No. 4029 were available. From seed of this number plants have been raised at the Arnold Arboretum which flowered in 1916 and 1917. The description given above is based on specimens collected May 2, 1916, and April 28 and May 6, 1917. In this Arboretum *P. dehiscens* survives ordinary winters, but it succumbed to the unusually cold winter of 1919–20; it is now represented here by young grafted plants.

Prunus dehiscens is apparently most closely related to *P. tangutica* Koehne. The flowers of the latter species scarcely differ from those of *P. dehiscens* and the same must be said of the fruit, if mature fruits collected by F. N. Meyer near Lan Tsai in southwestern Kansu belong to *P. tangutica;* they are dehiscent like those of *P. dehiscens* and the stones show no perceptible difference in size and sculpturing. The leaves, however, of *P. tangutica* are described as much larger and the petioles as often glandular; I, therefore, hesitate to form an opinion regarding the identity of the two species until I have seen complete material of *P. tangutica.*

Prunus Persica f. **duplex,** comb. nov. — *Amygdalus-Persica Persica* 2. *Persica-duplex* Weston, Bot. Univ. I. 7 (1770). — *Amygdalus Persica* δ *plena* Aiton, Hort. Kew II. 161 (1789). — *Amygdalus Persica flore pleno* Sweet, Hort. Brit. 133 (1827). — *Persica duplex* Poiteau & Turpin, Traité Arb. Fruit. I. 276, t (1835). — *Amygdalus Persica* β. *multiplex* Bunge in Mém. Sav. Etr. Acad. Sci. St. Pétersb. II. 96 (1838). — *Persica vulgaris* var. 4. *flore pleno* Hort. apud Loudon, Arb. Brit. II. 680 (1838).— *Persica vulgaris* var. *flore pleno roseo* Lavallée, Arb. Segrez. 68 (1877), nomen. — *Prunus Persica* var. *flore pleno* Voss, Vilmorin's Blumengärt. I. 232 (1894). — *Prunus Persica* var. *flore roseo-pleno* Nicholson in Handlist Arb. Kew I. 131 (1894), nomen. — *Amygdalus Persica rosea plena* Zabel in Beissner, Schelle & Zabel, Hand. Laubholz-Ben. 234 (1903).

Weston's varietal name has been adopted here though he wrote "Persica-duplex," but as in no other case he used a similar hyphenated name for a variety, I take the repetition of the specific name for a slip of the pen.

This form is an old inhabitant of gardens and according to Decaisne in Revue Horticole, 1851, p. 221, where he gives a good colored plate of this form, it was first mentioned in 1636 by Guy de La Brosse in his Description du Jardin Royal des plantes medicinales. Bauhin in his Pinax published in 1623 does not mention it.

Prunus Persica var. **nucipersica** Schneid. f. **aganonucipersica,** comb. nov. — *Persica laevis* var. α De Candolle, Fl. Franc. IV. 487 (1805). — Seringe in De Candolle, Prodr. II. 531 (1825). — *Persica violacea* Risso, Hist. Nat. II. 119 (1826). — Gallesio, Pom. Ital. pl. (1839). — Roemer Syn. Monog. III. 26 (1847).—*Amygdalus persica* b. *nucipersica* ζ *Aganonucipersica* Schübler & Martens, Fl. Würtemb. 305 (1834).

This group comprises the freestones of the Nectarine. As in the true Peaches[1] it is uncertain in this variety whether the freestone or the clingstone form represents the type of *P. Persica* var. *nucipersica* (L.) Schneid. and therefore both forms should receive a distinct name.[1]

Prunus Persica var. **nucipersica** f. **scleronucipersica,** comb. nov. — *Persica laevis* var. α De Candolle, Fl. Franc, IV. 487 (1805). — Seringe in De Candolle, Prodr. II. 531 (1825). — *Persica levis* Risso, Hist. Nat. II. 119 (1826). — Roemer, Syn. Monog. III. 27 (1847). — *Amygdalus*

[1] The True Peaches have been divided into the following two forms:

Prunus Persica f. **aganopersica** Voss in Puttlitz & Meyer, Landlex. VI. 345 (1914).—*Persica domestica* Risso, Hist. Nat. II. 104 (1826).—Roemer, Syn. Monog. III. 23 (1847).—*Amygdalus Persica* α. *Aganopersica* Reichenbach, Fl. Germ. Exc. 647 (1832).—Schübler & Martens, Fl. Würtemb. 304 (1834).—*Persica vulgaris* α. *tomentosa diapyrena* Moris, Fl. Sard. II. 6 (1840).—*Persica vulgaris* α. *aganopersica* Koch, Hort. Dend. 140 (1853).—*Persica vulgaris* 2b *isolata* Kuntze, Taschenfl. Leipzig, 273 (1867).

This group comprises the Peaches known as 'Freestones" in which the flesh is easily separable from the stone. As it is not clear which of the two groups of Peaches, the Clingstones or the Freestones, is the type of Linnaeus' *Amygdalus Persica*, it has been necessary in order to distinguish them by definite botanical names to give a name to each of these groups. The oldest varietal name seems to be "*Aganopersica*" which is credited by Voss to Reichenbach, but Schübler & Martens cite Dierbach. As the work of Schübler & Martens was published in 1834, Dierbach's name must have been published earlier, possibly in his "Systematische Uebersicht der um Heidelberg wildwachsenden . . . Gewächse" published in 1827, which I have not seen; in Dierbach's Grundriss der ökon.-techn. Botanik of 1836 the name appears (p. 160) as group "Aganopersicae" of *Persica vulgaris*.

Prunus Persica f. **scleropersica** Voss in Putlitz & Meyer, Landlex. VI. 345 (1914).—*Persica vulgaris* Risso, Hist. Nat. II. 94 (1826), Miller pro parte.—Roemer Syn. Monog. III. 23 (1847).—*Persica vulgaris* var. β. De Candolle, Fl. Franç. IV. 487 (1805).—Seringe in De Candolle, Prodr. II. 531 (1825).—*Amygdalus Persica* b. *Scleropersica* s. *Duracina* Reichenbach, Fl. Germ. Exc. 647 (1832).—*Amygdalus persica* II. *Duracina* Dierb. apud Schübler & Martens, Fl. Würtemb. 305 (1834).—*Persica vulgaris* a *tomentosa*** *sympyrena* Moris, Fl. Sard. II. 7 (1840).—*Persica vulgaris* γ. *Scleropersica* s. *duracina* K. Koch, Hort. Dendr. 140 (1853).

This group comprises the Peaches known as "Clingstones" in which the flesh firmly aheres to the stone. The name "*scleropersica*" like that of "*aganopersica*" seems to have originated with Dierbach; see remarks under the preceding form.

persica b. *nucipersica* η *scleronucipersica* Schübler & Martens, Fl. Württemb. 305 (1834). — *Persica vulgaris* β *levis violacea* Moris, Fl. Sard. II. 7 (1840).

This group comprises the clingstone Nectarines.

Prunus amygdalo-persica, comb. nov. (*P. communis* × *Persica*). — *Amygdalus Amygdalo-Persica* Weston, Bot. Univ. I. 7 (1770). — *Amygdalo-Persica* Duhamel ex Poiret in Nouv. Duh. IV. 112 (1809), pro synon.[1] *Amygdalus hybrida* Schmidt, Oesterr. Baumz. IV. 27, t. 207 (1822). — Dierbach, Syst. Uebers. Heidelberg Gew. 129 (1827), ex K. Koch, Hort. Dendr. 139; Grundr. Oekon.-tech. Bot. I. 157 (1836). — Poiteau & Turpin, Traité Arb. Fruit. I. 133, t (1835). — *Amygdalus communis* var. e *persicoides* Seringe in De Candolle, Prodr. II. 531 (1825). — ? *Amygdalus communis persica* Risso, Hist. Nat. 327 (1826). — *Amygdalus Persico-amygdala* Reichenbach, Fl. Germ. Exc. 647 (1832). — Spach, Hist. Vég. I. 381 (1834). — Roemer, Syn. Monog. III. 10 (1847). — *Amygdalus communis* δ ? *amygdalo-persica*[2] Spach in Ann. Sci. Nat. sér. 2, XIX. 115 (1843). — *Amygdalus communi-Persica* Klotzsch in Bonplandia, VI. 355 (1858). — *Amygdalus hortensis* Dochnahl, Sich. Führer Obstk. IV. 5 (1860). — *Prunus communis* δ *amygdalo-persica* Arcangali Comp. Fl. Ital. 209 (1882). — *Prunus Amygdalus* δ *persicoides* Koehne, Deutsch. Dendr. 315 (1893). — *Amygdalus persicoides* Decaisne apud Mouillefert, Arb. Arbriss. atl. t. 20 (1895).][3] — Zabel in Beissner, Schelle & Zabel, Handb. Laubholz-Ben. 234 (1903). — *Prunus persicoides* Vilmorin & Bois, Frut. Vilm. 61 (1904). — Ascherson & Graebner, Syn. Mitteleur. Fl. VI. 2, 139 (1906). — *Prunus persico-amygdala* Schneider, Ill. Handb. Laubho. I. 593 (1906). — *Prunus Amygdalus* var. *praecox* Bean, Trees & Shrubs Gt. Brit. II. 228 (1914).

Though Weston gives no description of his *Amygdalus Amygdalo-Persica* it is clear that his name must be based on Duhamel's name "Amygdalo-Persica" published two years earlier. If Weston's name should be rejected for the reason that it lacks a description, Schneider's *P. persico-amygdala* based on *Amygdalus Persico-amygdala* Reichenb. would be the

[1] Poiret cites Duhamel's name as one of the varieties of *Amygdalus communis* without making a varietal combination. Duhamel's name must be considered pre-Linnean, as are the following: *Amygdalopersicus* Camerarius, Hort. Med. Philos. 14 (1588). — *Persica amygdaloides* Bauhin, Pinax, 440 (1623). — *Amygdalo-persica* Duhamel, Arb. Fruit. I. 127, t. 4 (1768). — Under the name "Amandier-Pecher" it has been figured by Noisette, Jard. Fruit. t. 3, fig. 1 (1821) and by Jaume St. Hilaire, Fl. & Pom. t. 368 (1830?), and as "Peach-almond hybrid" by Leonard Coates in Jour. Hered. XII. 327-328 (habit of tree and fruits) (1922.)

[2] Reichenbach quotes Dalechamp as author of this combination but I have not been able to find that name in the Historia generalis plantarum of that author, only "*Persica Amygdala*" occurs there of which I am not sure if it belongs here.

[3] Mouillefert cites "*Amygdalus persicoides* Nouv. Duham." in the text (p. 391) as a variety of *A. communis* without, however, using a varietal combination; on the plate the name appears as "*A. persicoides* Deene". — In Index Kewensis C. Koch is cited as the author of this combination, but he only quotes "*Persicoides* Ser." as one of the synonyms of the "Mandelpfirsich oder Pfirsichmandel" which he refers to *Amygdalus Persica* as a form.

correct name, for Schmidt's *A. hybrida* though the next oldest name and accompanied by a good colored plate, cannot be transferred to Prunus on account of *Prunus hybrida Quetierii* Carr. apud Mouillefert, Arb. Arbriss I. 401 (1895), a supposed hybrid between *Prunus Armeniaca* L. and *P. Persica* Batsch.

Prunus amygdalo-persica is very handsome on account of its large and showy pinkish flowers; it has proved perfectly hardy at the Arnold Arboretum and flowers profusely almost every year, while the forms of *P. communis* Arcang. are not hardy in this Arboretum.

Prunus argentea, comb. nov.—*Amygdalus orientalis* Miller, Gard. Dict. ed. 8 (Amygdalus No. 3) (1759). — *Amygdalus argentea* Lamarck Encycl. Méth. I. 103 (1783). — *Prunus orientalis* Koehne, Dendr. 315 (1893), not Walpers.

As Koehne's combination is preoccupied by *P. orientalis* Walpers (Rep. II. 911 [1843]) based on *Cerasus orientalis* Spach (in Ann. Sci. Nat. sèr. 2, XIX. 128 [1843]), the *Amygdalus orientalis* Mill. if referred to the genus Prunus must receive another specific name and for this its later synonym *A. argentea* is available. In the Index Kewensis *Prunus orientalis* Walpers is referred as a synonym to *P. microcarpa* C. A. Mey., but the descriptions of the two species differ in some important characters, they are from different localities and Boissier refers *C. orientalis* Spach only "ex parte" to *P. microcarpa* C. A. Mey. Specimens of *P. microcarpa* from the Caucasus collected by F. N. Meyer certainly do not agree with Spach's description of his *Cerasus orientalis*.

Prunus glandulosa f. **sinensis** Koehne in Sargent Pl. Wilson. I. 265 (1912). — Add to the synonyms: *Amygdalus pumila* Linnaeus, Mant. 74 (1767). — Sims in Bot. Mag. XLVII. t. 2176 (1820). — *Cerasus japonica β multiplex* Seringe in De Candolle, Prodr. II. 539 (1825), pro parte. — *Cerasus chinensis* G. Don, Gen. Syst. II. 514 (1832). — *Cerasus japonica* 2. *multiplex* Loudon, Arb. Brit. II. 706, fig. 415, 416 (1838). — *Prunus chinensis* D. Dietrich, Syn. Pl. III. 44 (1843).

There are two older varietal names which are partly applicable to this form, but both being doubtful, it seems best to retain the name proposed by Koehne. The oldest of these varietal names is *Amygdalus nana duplex* Weston, Bot. Univ. I. 7 (1770). Its English name is given as "Double flowering dwarf Almond" which is without doubt the pink double-flowered form of *P. glandulosa* well known in gardens at that time, but as the Latin name is proposed as a variety distinguished from it only by the phrase "flore incarnato pleno," of *Amygdalus nana* which is according to the description *A. nana* L., an entirely different plant, it does not seem advisable to accept the name on the strength only of the English name cited and for the reason that no double-flowered form of *A. nana* L. is known. The second varietal name is *Cerasus japonica β. multiplex* Seringe in De Candolle, Prodr. II. 539 (1825). This belongs as regards the

citations of Linnaeus and Sims and the statement "frequens in hortis culta" to the form in question, but Seringe says "excl. syn. Plukenet" though Plukenet's figure undoubtedly belongs to this form; as to the citation of Ker Seringe's name refers to *P. japonica* var. *Kerii* Koehne. Thus it seems that Seringe's name is chiefly based on the plant here called *P. glandulosa* f. *sinensis*, but the fact that Seringe published it as a form of *Cerasus japonica* makes its application doubtful and it therefore seems wise to abandon this name and retain Koehne's names for the two forms. I can not, however, agree with Koehne in referring *Cerasus japonica* β *multiplex* Seringe, though only "pro parte," to *P. glandulosa* f. *albiplena* Koehne; as pointed out, it belongs partly to *P. glandulosa* f. *sinensis* and partly to *P. japonica* var. *Kerii*.

The origin and time of introduction of this form is uncertain; it was apparently introduced into cultivation about the middle of the 17th century, for in 1687 Hermann (Hort. Acad. Lugd.-Bot. Cat. 487, 489), states that he found it frequently cultivated in English gardens, and introduced it from there into Belgium; he further states that he had seen it growing luxuriantly at the Cape of Good Hope, but the latter statement is apparently an error of memory. He describes it and figures it under the name "*Persica malus Africana nana flore incarnato pleno.*" A better figure is given 13 years later by Plukenet (Phytogr. t. 11, fig. 4) and on the same plate as fig. 4 a good illustration of *P. nana* Focke under the name "*Amygdalus Indica nana*" appears, which was frequently cultivated in Belgium about 1687 according to Hermann. The "*Persica malus Africana nana flore incarnato simplici*" mentioned by Hermann without further description is probably the typical form raised from seed of the double form, for in the description of the latter he says "flores . . . aliquando simplici petalorum serie referti."

Prunus japonica var. **Kerii** Koehne in Sargent Pl. Wilson. I. 267 (1912).— Add the following synonyms: *Cerasus japonica β. multiplex* Seringe in De Candolle, Prodr. II. 539 (1825), pro parte. — *Cerasus japonica* var. *multiplex* G. Don, Gen. Syst. II. 514 (1832). — *Cerasus sinensis* Loudon, Arb. Brit. II. 706, fig. 417 (1838) — *Prunus japonica* β. *multiplex* D. Dietrich, Syn. Pl. III. 44 (1843). — Transfer *Amygdalus pumila* Sims to *P. glandulosa* f. *sinensis*.

This form is apparently not now in cultivation; it was introduced according to Ker about 1808 by Charles Greville from China to England and about 1815 was growing in the nursery of Lee and Kennedy in Hammersmith under the name *P. japonica*. The drawing of *Amygdalus pumila* Sims in Botanical Magazine referred by Koehne to this form, but belonging as I am convinced to *P. glandulosa* f. *sinensis*, was made from a plant received from the same nursery, where it had been already in cultivation about 1774 according to a specimen in the Banksian Herbarium, as stated by Sims. Loudon states that both forms were still growing in the Hammersmith nursery about 1838.

Prunus japonica var. **fukienensis**, var. nov.

A typo recedit ramulis junioribus dense minute pilosulis, foliis subtus ad costa venasque sat dense interdum ad venulas sparsius hirto-pilosis, pedicellis et calycis tubo breviter pilosis, sepalis latioribus extus pubescentibus intus puberulis, stylo basi piloso. — Ramuli graciles, tenues; folia elliptico-ovata, 2.5–4 cm. longa, subito caudato-acuminata, basi rotundata, breviter duplicato-serrata, supra breviter scabro-pilosula; petioli pilosuli, 1–3 mm. longi; stipulae lineares, ad 6 mm. longi, interdum extus pinnatifidae, longe glanduloso-ciliatae; pedicelli circiter 1 cm. longi; sepala ovalia, glanduloso-serrulata, circiter 4 mm. longa; flores deflorati tantum visi.

Fokien: Without precise locality, April to June, 1905, *P. T. Dunn* (Hongkong Herb. No. 2654, type, 2662).

This new variety is nearest to *P. japonica* var. *Nakaii*, but differs in its pubescent branchlets, the smaller less deeply and less doubly serrate leaves, their shorter and broader acumen and the rounded base of the leaf. It also shows some relation to *P. japonica Oldhamii* Koehne, with which it agrees in the serration and shape of the leaves though they are smaller and comparatively broader in var. *fukienensis*, but differs in its pubescence which in *P. japonica Oldhamii* is present only on the midrib and usually also on the veins beneath, though occasionally the very young branchlets may be minutely puberulous and the sepals puberulous on the inner surface. This variety seems also to be related to *P. carcharias* Koehne of which I have seen no specimens, but the branchlets of that species are described as densely hirsute with yellowish hairs, the stipules are trifid and up to 12 mm. long and the leaves are much larger, densely accumbent-pilose beneath and more loosely so above.

Prunus japonica var. **Nakaii**, comb. nov. — *P. Nakaii* Léveillé in Fedde, Rep. Nov. Sp. VII. 198 (1909). — Koehne in Sargent, Pl. Wilson. I. 267 (1912). — Nakai, Fl. Sylv. Kor. v. 36, t. 22 (1916).

Korea: Ouen-san, in lacunis montium, July, 1906, *U. Faurie* (No. 334, type). Prov. Heian: in collibus Chinnampo, June, 1901, *U. Faurie* (No. 77); Taijudo, French Mine, road-sides, common, alt. 400 m., June 18, 1917, *E. H. Wilson* (no. 8636). Prov. Keiki: Koryo, 30 miles northeast of Kaijyo, road-sides, common, July 8, 1917, *E. H. Wilson* (No. 8748); Mountains behind Kaijyo, road-sides, August 20, 1918, *E. H. Wilson* (No. 10596). Prov. N. Kaisho: Hoko, May 29, 1917, *E. H. Wilson* (No. 8493).

I am unable to separate *P. Nakaii* Lév. from *P. japonica* Thunb. as a species; in habit, general appearance, flower, fruit and leaf it differs little from typical *P. japonica* except in the pubescence of the different parts. The leaves of *P. Nakaii* are usually rather densely pubescent beneath and less densely so or nearly glabrous above, the pedicels and calyx-lobes vary from short-pilose to glabrous and the sepals are puberulous on the inner surface, but in Wilson's No. 10596 the leaves are much

less pubescent though the fruiting pedicels, at least on some specimens, show traces of pubescence, otherwise the specimens of this number differ little from *P. japonica Engleri* Koehne which is known from Manchuria. In Wilson's No. 8748 and Faurie's No. 77 the fruiting pedicels show no trace of pubescence, though the leaves beneath are pilose all over in Faurie's specimen and densely so on the veins in Wilson's specimen.

Prunus japonica var. *Nakaii* is growing at the Arnold Arboretum where it was raised from seed of Wilson's No. 10596 sown in December, 1918, and germinating in April 1920; it has not yet flowered here.

Prunus triloba Lindl. f. **normalis**, nom. nov. — *Prunus triloba* Stapf in Bot. Mag. CXXXII. t. 8061 (1906).

A typo recedit floribus normalibus simplicibus.

The nomenclatorial type of *P. triloba* is the double flowered form introduced in 1855 by Fortune from China into England and first described by Lindley in 1857. This form is known as *P. triloba plena* Dipp. and the form with single flowers is usually called the type. From the nomenclatorial point of view, however, the case should be just reversed and it seems therefore advisable to give to the phylogenetic type a distinct name, for which I propose f. *normalis*. The single-flowered form was apparently first introduced into cultivation by Dr. Bretschneider who sent seeds in 1883 and 1884 from Peking to the Arnold Arboretum; the plants raised from this seed flowered for the first time in 1888.

Prunus Cerasus f. **plena** Linnaeus, Spec. I. 474 (1753), as var. — *Prunus-Cerasus Cerasus* 4. *plena* Weston, Bot. Univ. I. 224 (1770). — *Cerasus caproniana* ε. *multiplex* Seringe in De Candolle, Prodr. II. 537 (1825). — *Prunus Cerasus* β. *flore pleno* Sweet, Hort. Brit. 134 (1827). — *Cerasus vulgaris* 3. *flore pleno* Hort. apud Loudon, Arb. Birt. II. 694 (1838). — *Cerasus austera* β. *multiplex* Roemer, Syn. Monog. III. 75 (1847). — *Cerasus acida* 3. *flore pleno* Kirchner in Petzold & Kirchner, Arb. Muse. 252 (1864). — *P. Cerasus flore albo pleno* Hartwig, Ill. Gehölzb. 287 (1892). — *Prunus Cerasus* f. *semiplena* Schneider Ill. Handb. Laubholzk. 616 (1906). — Voss in Putlitz & Meyer Landlex VI. 347 (1912), as subsp. *vulgaris* forma.

The varietal name given by Linnaeus to the double-flowered form of *P. Cerasus* seems to have been neglected by almost all later authors, but as he quotes "Cerasus hortensis flore pleno Bauh. pin. 450," the name cannot be intended for any other form then that well known since the 16th century and figured by several pre-linnean writers under various names.[8] Its flowers are not perfectly double, but have a smaller or

[8] *Cerasus vulgaris dupliciflora* Lobel, Icon. II. t. 172 (1581). — *Cerasus multiflora*, Tabernaemontanus, Kräuterb. 693, fig. (1588). — *Cerasus multiflora* II. Tabernamontanus, l. c. 694, fig. (1588). — *Cerasus flore pleno* Besler, Hort. Eystet. I. fol. 4, fig. 1 (1613). — *Cerasus hortensis flore pleno* Miller, Fig. Pl. I. 59, t. 89 (1760). — "Cérisier à fleur semidouble" Duhamel, Arb. Fruit. I. 173, t. 5 (1768). — Loiseleur in Nouv. Duh v. 19 (1812).

greater number of stamens with fertile anthers and usually normal ovaries; they therefore occasionally produce fruits. The form with perfectly double flowers without stamens and a rudimentary ovary changed into two leafy carpels was first described by Loiseleur (in Nouv. Duh. v. 20 1912) as "Cérisier à fleur double" and is apparently the form now called ***P. Cerasus*** f. ***Rhexii*** Voss.[1]

The double-flowered form of *P. avium* L. seems to have been unknown to Linnaeus, but the *Prunus-Cerasus sylvestris plena* mentioned by Weston in 1770 can hardly be any other than this form which according to Loiseleur (in Nouv. Duhamel, v. 11) is the *Cerasus major ac sylvestris multipliciflore* of Tournefort (Inst. 627) and the *Cerasus major sylvestris flore pleno* of Duhamel (Arb. Fruit I. 157). It apparently originated in France some time before 1700, but seems to have been little known outside of France before the beginning of the 19th century. Its correct name, therefore, is *P. avium* f. *plena* Schneider (Ill. Handb. Laubholzk. I. 616 [1906]).

Prunus mahaleb f. **xanthocarpa**, comb. nov. — *Cerasus Mahaleb 2. fructo flavo* Hort. apud Loudon, Arb. Brit. II. 707 (1838). — *Cerasus Mahaleb α. xanthocarpa* Roemer, Syn. Monog. III. 80 (1847).[2] — *Prunus Mahaleb* var. *fructu luteo* Jaeger, Ziergeh. 398 (1865). — ? *Cerasus Mahaleb* var. *fructu albo* Lavallée, Arb. Segrez. 75 (1877), nomen. — ? *Prunus mahaleb* var. *fructo albo* Mouillefert, Arb. Arbriss. I. 449 (1892). — *Prunus Mahaleb* var. *chrysocarpa* Nicholson in Kew Handlist Arb. I. 143 (1894), nomen. — Gard. LXII. 181, fig. (1902), nomen. — Schneider, Handb. Laubh. I. 617 (1907), as forma.

This form with yellow fruit I find first mentioned in 1812 by Loiseleur (in Nouv. Duhamel v. 7) and it must have been well known at that time, as he says that the variety with yellow fruit is more widely distributed in gardens than the variety with large leaves. The form enumerated as "fructu albo" by Lavallée and by Mouillefert is unknown to me, but probably it does not differ much from the form with yellow fruit.

[1] *P. Cerasus* f. *Rhexii* Voss, Vilmorin's Blumengärt. I. 233 (1894).—Bailey, Cycl. Am. Hort. III. 1454 (1901), as var.—? *Cerasus acida γ. plena* Roemer, Syn. Monog. III, 65 (1847).—*Cerasus acida 5. Rhexii* Kirchner in Petzold & Kirchner, Arb. Muse. 252 (1864).—*Cerasus avium fl. pl. serotino* Booth's Cat. ex Kirchner, l. c. (1864), as synon.—*Cerasus Rhexii* Hort. ex Kirchner, l. c. (1864), as synon.—*Prunus Cerasus* var. *Rhenii*[sic] Jaeger, Ziergeh. 394 (1865).—*Cerasus caproniana ranunculiflora* Vanhoutte, Fl. des Serres XVII. t. 1805 (1868).—*Cerasus vulgaris Rhexii* Hartwig & Ruempler, Bäum. & Sträuch. 145 (1875).—*Prunus Cerasus Rhexii plena*, Jaeger & Beissner, Ziergeh. ed. 2, 266 (1884).—*P. Cerasus caproniana ranunculifera*, Jaeger & Beissner, l. c. (1884).—*P. Cerasus Rhexii flore pleno* Wittmack in Deutsch. Garten-Zeit. 224, fig. (1886).—D. in Garden LXXVIII. 227 fig. (1914).—Wayland in Gard. LXXXI. 184, (1917).—E. W. S. in Garden LXXXIII. 94, fig. (1919).*P. Cerasus flore albo pleno Rhexi.* Hartwig, Ill. Gehölzb. 287 (1892).—*P. Cerasus* f. *ranunculiflora* Voss, Vilmorin's Blumengärt. I. 33 (0894).—*Prunus caproniana serotina flore pleno* Zabel in Biessner, Schelle & Zabel, Handb. Laubholz-Ben. 240 (1903).—*P. Cerasus* subsp. *vulgaris* f. *plena* Loisl. apud Voss in Putlitz & Meyer, Landlex. VI. 347 (1914), excl. *synom.*

[2] Roemer quotes a synonym "var. *hortensis* Spach" but Spach (Hist. Veget. I. 409, 1834) does not give a varietal name to this form, he only mentions it in the description "Drupe noir (jaune dans une variété de jardin)."

LEGUMINOSAE

Sophora japonica var. **vestita**, var. nov.

A typo recedit foliis supra laxe breviter accumbenti-pubescentibus, subtus molliter dense subaccumbenti-villosis, petiolis rhachibusque, inflorescentia, ramulis dense breviter villosis, tomento in ramulis ad secundum annum persistente.

CHINA. Hupeh, north and south of Ichang, alt. 1–3000 ft., July 1907, *E. H. Wilson* (No. 651, partly, type); Hsing-shan Hsien, open country, alt. 1–3000 ft., October 1907, *E. H. Wilson* (No. 651 partly).

This variety with its velutinous branchlets, inflorescence and petioles and the soft-pubescent under side of the leaflets appears quite distinct from the typical form which has glabrous or glabrescent branchlets, inflorescence and petioles and the under side of the leaves furnished with a strigillose pubescence so closely appressed as to be almost imperceptible to the naked eye, although in all other characters it agrees with the type.

This variety seems to occur only in western Hupeh, while the following variety which may be considered intermediate between this variety and the typical form, has a much wider distribution.

Sophora japonica γ **pubescens** Bosse, Vollst. Handb. Blumengärt. ed. 2, III. 408 (1842).—Lavallée, Arb. Segrez. Enum. 54 (1877)[1]. —*S. pubescens* Tausch in Flora, XVII. 489 (1834).—*Styphnolobium japonicum pubescens* Hort. apud Kirchner in Petzold & Kirchner, Arb. Musc. 366 (1864).—*S. japonica* var. *tomentosa* Hort. apud Dieck, Haupt-Kat. Zöschen, Nachtr. I. 26 (1887), nomen.—*S. Korolkowii* Dieck apud Koehne, Dendr. 323 (1893), in nota.—Cornu in litt. apud Dippel, Handb. Laubholzk. II. 662 (1893).—*S. violacea* Dippel, Handb. Laubholzk. II. 663 (1893), pro parte.—*S. tomentosa* hort. apud Dippel, l. c. 663 (1893).—*S. sinensis* Hort. apud Rehder in Möller's Deutsch. Gärtn.-Zeit. XIII. 184 (1898).—*S. japonica* [f.] *chinensis* Hort. apud Zabel in Beissner, Schelle & Zabel, Handb. Laubholz-Ben. 256 (1903), nomen.—*S. chinensis* Hort. ex Zabel, l. c. (1903), pro synon.—*S. japonica tomentosa* Hort. apud Zabel, l. c. (1903).—*S. japonica* [f.] *Korolkowii* hort. apud Zabel, l. c. (1903).—A. Henry in Elwes & Henry, Trees Gr. Brit. Irel. I. 38 (1906), as var.

This variety which differs from the type in the soft-pubescent underside of the leaflets, was first noticed in 1834 by Tausch. He distinguished it as a species with "foliis subtus pubescentibus" from *S. japonica* which he describes as: "foliis . . . subtus glaucis glabris," which is, however, not quite correct as the underside is not glabrous, although it appears so to the naked eye, while in the form in question the villous but slightly appressed pubescence is easily discernible by the eye as well as by the touch. In addition to the character of the pubescence Tausch makes

[1] Lavallée bases the variety on *S. pubescens* Tausch, but Bosse gives no authr citation; he only describes it as a variety with hairy leaves and states that the plant is for sale in Flottbeck. Probably the name of this variety will also be found in one of the catalogues of J. Booth's nursery prior to 1842.

out distinctions between his two species in regard to the shape of the calyx and to the color of the petals, but these do not seem to me of any value. The different forms introduced later under various names, as cited in the synonomy above, seem to be referable to this variety; they have the under side of the leaflets soft-pubescent, though their shape differs somewhat in the different forms. There is little or no difference between *S. Korolkowii* and *S. sinensis* as cultivated in this Arboretum; both have oblong-ovate to oblong-lanceolate leaves, rounded to truncate or even subcordate at the base and the keel and wings of the flowers have a slight purplish tinge toward the margin and purple claws, while *S. tomentosa* of which I have not seen flowers, has according to a specimen from a young plant shorter and broader leaves, broad-cuneate to rounded at the base. The shape of the leaves, however, may vary with age, as a specimen from a young plant of *S. Korolkowii* which I collected about 25 years ago in Spaeth's nursery has broad-cuneate leaflets, while our mature trees received from the same nursery have the leaflets rounded or truncate at the base.

Of the origin of these different forms nothing definite is known. *Sophora Korolkowii* came according to Koehne, Henry and Bean from the Arboretum at Segrez, France; judging from its name the plant may have been introduced by Korolkov who sent seeds to Lavallee from Turkestan before 1880, but *S. japonica* is not known in Turkestan. The author citation "Cornu" may be explained by the fact that seeds had been distributed by the Jardin des Plantes of which Cornu was director at that time. *Sophora sinensis* also came into gardens by the way of France, at least on a specimen I collected at Spaeth's nursery about 25 years ago I had noted that the plant was received from Croux, a nursery firm near Paris. Of the origin of *S. tomentosa* I know nothing beyond the fact it was advertised by Dieck in 1887. Of the two Mongolian forms introduced by Dieck, one of which according to Koehne agrees with *S. Korolkowii*, I have not seen specimens.

The following specimens of wild plants I refer to this variety:

China. Hupeh, Patung Hsien, alt. 1-3000 ft., July, August and September 1907, *E. H. Wilson* (No. 651). Szech'uan, Chentu Plain, alt. 1-2000 ft., July 1908, *E. H. Wilson* (No. 2557).

Korea. Keiki province, Kongo, 30 miles northeast of Keijyo, July 8, 1917, *E. H. Wilson* (No. 8741 "hairy and glabrescent form, truly wild").

In these specimens the leaflets are broad-cuneate to nearly rounded at base, but not truncate as in the form cultivated as *S. Korolkowii*. In the specimen from Szech'uan the pubescence is more villose and distinctly yellowish along the midrib.

Sophora japonica var. *violacea* Carrière (in Rev. Hort. 1865, 465), which had been confused by Dippel with *S. chinensis* or *sinensis* hort., a synonym of the preceding variety, is nearer to typical *S. japonica* in the pubescence of its leaves, but the wings and the keel of the flowers are stained with light purple and the flowers appear very late in autumn.

According to Mr. Joseph Hers, secretary of the Lunghai Railroad, to whom we are indebted for much valuable herbarium material from the provinces of Honan and Chihli, the Chinese distinguish three varieties of *Sophora japonica* differing in the color of the wood. In a letter dated December 20, 1919, Mr. Hers gives the following information:

"Three forms of Sophora are known in Honan, as well as in Chihli: the pai-kuai, or white Sophora; the tow-tsing kuai, or bean-green Sophora; the hei-kuai, or black Sophora.

"The white form gives the best wood; a 'liao' of white Sophora being worth $7 or $8, while a liao of green costs only $6, and a liao of black not more than $4 or $5; the liao is the Peking unit for the timber trade and represents a log of one foot in diameter, and 7 feet in length.

"Around Peking the black Sophora is not very common; the natives say that it never reaches a great age and as the wood is not of much value, they never plant it. All the very large and old specimens, for instance those of the Temple of Heaven, are said to be 'white.' In Honan, the black form is more common.

"The main difference lies in the colour (and quality) of the wood, which is either pure white, or greenish white, or blackish, and in the bark. The bark of the black Sophora is deeply corrugated and of a darker colour, while that of the white is much paler and smoother.

"The difference in the bark of the white and green forms is not very apparent, but the difference between black and white is so striking that no Chinese, of the carpenters or peasants class, will ever hesitate a minute in saying: this is a black and this is a white Sophora.

"The Chinese say that there is no difference in the leaves or flowers of the three forms; the leaves of the black form seem however to be shorter, of a darker green above and smooth beneath."

Genista tenera O. Kuntze, Rev. Gen. I. 190 (1891).—*Cytisus tener* Jacquin, Icon. Pl. Rar. I. 15, t. 147 (1786?); Coll. I. 40 (1786).—Linnaeus, Syst. Nat. ed. 13 aucta, II. pt. 2, 1115 (1791).—*Spartium virgatum* Aiton, Hort. Kew. III. 11 (1789).—*Genista gracilis* Poiret in Lamarck, Enc. Méth. Suppl. II 715 (1811).—*Genista virgata* Link, Enum. Hort. Berol. II. 223 (1822).—De Candolle, Prodr. II. 149 (1825).

There can be no doubt that *Genista tenera* is the correct name of the species generally known as *G. virgata* Link, as *Cytisus tener* Jacquin is the oldest name for it; Jacquin's name is cited by Aiton as a synonym of his *Spartium virgatum* and both these names are cited as synonyms of *Genista gracilis* by Poiret.

Genista januensis Viviani, Elench. Pl. Hort. Dinegro, 19 (1802).—*Genista triangularis* Willdenow Sp. Pl. III. pt. 2, 939 (1803). *Genista scariosa* Viviani in Ann. Bot. I. pt. 2, 175 (1804).—*Genista triquetra* Waldstein & Kitaibel, Pl. Rar. Hung. II. 165, t. 153 (1805), non Lamarck (1788). —*Genista genuensis* Persoon, Syn. II. 287 (1807).—*Cytisus triangularis* Viviani, Fl. Dalm. III. 268 (1852).

As Schneider points out (Ill. Handb. Laubholzk. II. 32), the oldest name for the plant generally known as *G. triangularis* Willd. will be *G. januensis*, if the statement of O. Kuntze (Rev. Gen. I. cxxxiv), that part II of vol. III of his Species plantarum appeared in 1803 is true. Parts II and III of this work have no title-page only part I has a title-page dated 1800, which, however, should be according to Kuntze 1801. As part I of volume IV is dated 1805, I see no reason to doubt the correctness of Kuntze's statement taken from Kayser's Bücherlexikon (H-L 1835), for it is reasonable to assume that the publication of part II and III of vol. III came between the publication of part I of vol. III and part I of vol. IV and that these parts were not published in the same year as part I of vol. III. Viviani's Elenchus the preface of which is dated July 2 1802 was probably published soon after that date as it is an octavo of only 36 pages.

Cytisus scoparius Lk. f. **plenus,** nom. nov.—*C. scoparius* 3. *flore pleno* Hort. apud Loudon, Arb. Brit. II. 595 (1838).

The origin of this slightly double form is not known to me. I have been unable to find any mention of it before 1838 and Loudon says nothing of its origin.

Cytisus scoparius Lk. f. **erniensis,** var. nov.—*Sarothamnus erniensis* A. Chevalier in Bull. Soc. Bot. France, LXVII. 324 (1921).

This form differs from *C. scoparius* f. *Andreanus* Dippel in having all the petals changed to a bright red color. Both forms originated from a plant found about or probably before 1870 in France near Ernée (Mayenne). More detailed information about the origin of these two forms is given by Chevalier in the publication cited above.

Cytisus glabrescens Sartorelli, Alb. Indig. Ital. Sup. 282 (1816).—*C. emeriflorus* Reichenbach, Fl. Germ. Excurs. 524 (1832).—*Genista glabrescens* Briquet, Études Cytis. Alp. Marit. 123 (1894).

Schinz & Thellung (in Bull. Herb. Boiss. sér. 2 VII. 188 [1907].) and Schneider (Ill. Handb. Laubh. II. 45 [1907].) have rejected the name *C. glabrescens* Sartorelli and taken up instead *C. emeriflorus* on account of the older homonym *C. glabrescens* Schrank (Baier, Fl. 269) of 1789 but that is without doubt a straight synonym of *C. scoparius* Link and is therefore not valid. In reading Schrank's description carefully, one will find that it agrees exactly with *C. scoparius* Link except that the leaves are described as shorter than the petioles, but this is apparently a slip of the pen; instead of "petioles (Blattstiele)" he must have meant "pedicels (Blüthenstiele)." In literature Schrank's name seems to have been either overlooked or treated as a doubtful name.

Cytisus albus var. **microphyllus,** comb. nov.—*C. microphyllus* Boissier, Diagn. Fl. Or. sér. 2, II. 5 (1857).—*C. austriacus* var. *microphyllus* Boissier, Fl. Or. II. 53 (1892).—*C. leucanthus* var. *microphyllus* Boissier, Fl. Or. Suppl. 161 (1888).—*C. supinus* subsp. *albus* var. *microphylloides*

Briquet, Études Cytisus Alp. Marit. 174 (1894).—*C. supinus* subsp. *C. albus* 6 *microphyllus* Ascherson & Graebner, Syn. Mitteleur. Fl. VI. 2, 329 (1907).

This a small prostrate form with smaller leaves and white flowers of *C. albus* known from Transylvania and Thessaly. Its oldest varietal name is "*microphyllus*," but Briquet when making it a variety of *C. supinus* had to change it on account of the older homonym *C. supinus* γ *microphyllus* Wimmer & Grabowski, Fl. Siles. II. 2, 50 (1829). The name "*microphyllus*" can stand only if considered a varietal name, as *C. microphyllus* Boiss. is antedated by *C. microphyllus* Link of 1826 and therefore is not valid. Ascherson and Graebner call *C. albus* a subspecies of *C. supinus* but cite it as a binomial which is against the International Rules. As *C. albus* Hacquet of 1790 has priority of *C. albus* Link of 1822 based on *Genista alba* Lamarck of 1786, the combination *C. multiflorus* Sweet, must be used for the latter species, based on the next oldest name *Spartium multiflorum* Aiton of 1789.

Cytisus albus var. **pallidus,** comb. nov.—*Cytisus leucanthus* var. *pallidus* Schrader apud De Candolle, Prodr. II. 155 (1825).—*C. banaticus* Grisebach & Schenk in Wiegn. Archiv. XVIII. 292 (1852).—*C. austriacus* var. *pallidus* Neilreich, Aufzaehl. Ung. Slavon. Pfl. 330 (1866).—*C. pallidus* Kerner, Abhäng. Pflanzengest. 6 (in Festschr. Versamml. 43. Deutsch. Naturf. Aerzte) (1869), non Poiret.—*C. variabilis* Blocki in Oester. Bot. Zeitschr. XXXIV. 425 (1884), pro parte.—*C. supinus* subsp. 2, *pallidus* γ var. pallidus Briquet, Études Cytises Alp. Marit. 174 (1894).—*C. supinus* [subsp.] II. *C. pallidus* 9 *banaticus* Ascherson & Graebner, Syn. Mitteleur. Fl. VI. 2, 329 (1907).

This is a form with pale yellow flowers. If considered a distinct species, it must bear the name *C. banaticus* Grisb. & Schenk, as *C. pallidus* is not a valid name being antedated by *C. pallidus* Poiret, Enc. Méth. Suppl. II. 442 (1811). Moreover the combination *C. pallidus* probably based on *C. leucanthus* var. *pallidus* Schrader had been published twice before Kerner used it, though in both cases as a synonym: *C. pallidus* Steudel, Nomencl. ed. 2, I. 477 (1841), as a synonym of *C. leucanthus.*—*C. pallidus* Kitaibel apud Nyman, Consp. Fl. Eur. 157 (1878), as a synonym of *C. capitatus.*

Wistaria formosa (*W. floribunda* f. *alba* × *sinensis*), hybr. nov.

Twining shrub; young branchlets silky-pubescent; leaves 9–13-foliolate, rarely 7- or 15-foliolate; leaflets oblong, 5–7.5 cm. long and 2–3 cm. broad, acuminate, broadly cuneate at base, entire or occasionally sparingly and minutely denticulate, silky-pubescent at first on both sides, at maturity bright green above and glabrous, lighter green and lustrous beneath with scattered appressed hairs, the midrib toward the base like the petiolule minutely pubescent; petiole and rachis silky-pubescent at first, becoming glabrous. Racemes including the short peduncle about

25 cm. long; rachis densely short-villose; pedicels 1–1.2 cm. long, spreading at a right or somewhat acute angle, rather stout, straight, finely villose; calyx about 7 mm. broad and 5 6 mm. high, finely villose, 2-lipped, the lower lip 3-lobed with broadly triangular, subulate-acuminate lobes, the middle one about 4 mm., the lateral ones 2.5 mm. long; corolla pale violet, wings and keel darker, slightly fragrant, standard about 2 cm across and slightly shorter, with rather thin slightly recurved ligular appendages; wings with the claw 1.7–1.8 cm. long; keel 1.5 cm. long. Pod 7–8.5 cm. long, and 1.8–2 cm. wide at the apex, gradually attenuated toward the base, densely tomentose, usually 1-seeded.

Cultivated at Holm Lea, Brookline, Mass.; specimens collected May 27 and September 12, 1921, preserved in the herbarium of the Arnold Arboretum.

This handsome hybrid originated at Holm Lea about 1905 from seed of *Wistaria floribunda* f. *alba* Rehd. & Wils. planted by Charles Sander and apparently fertilized by pollen of *W. sinensis* flowering simultaneously in the greenhouse. The hybrid is nearly exactly intermediate between these two species. From *W. sinensis* Sweet it is easily distinguished by the larger number of less pubescent leaflets (7–11 in *W. sinensis*), by the longer racemes, the shorter pubescence of the rachis, the long-acuminate lobes of the lower lip of the calyx and by the smaller corolla. From *W. floribunda* it differs chiefly in the smaller number of leaflets narrowed toward the base (13–17 and usually rounded at the base in *W. floribunda*), in the shorter racemes, the shorter and stouter pedicels, the larger corolla, and in the thinner slightly recurved appendages of the standard.

The hybrid as an ornamental plant is superior to both parents, as the racemes are longer than those of *W. sinensis* and fuller, though shorter than those of *W. floribunda* (*W. multijuga* Van Houtte), because the flowers of each raceme all open almost at the same time, while in *W. floribunda* the basal flowers are already dropping, before the terminal ones have opened.

Robinia pseudoacacia L. f. **unifoliola** Talou in Horticulteur Franç. 1859, 157, as var.—*R. pseudo-acacia monophylla* Carrière in Rev. Hort. 1860, 630, fig. 121, 122.—Hartwig & Ruempler, Bäume & Sträuch. 490 (1875), as var.—Voss, Vilmorin's Blumengart. 1. 218 (1894), as forma.—*R. monophylla* Jaeger, Ziergeh. 461 (1865).—*R. Pseudacacia heterophylla* hort. ex Beissner, Schelle & Zabel, Handb. Laubholz-Ben. 271 (1903).

The oldest varietal name for the interesting form generally known as var. *monophylla* is *unifoliola* Talou as cited above. It was raised about 1855 by Deniau of Brain-sur-l'Authion, Maine-et-Loire, (according to Carrière) or, of Angers (according to Talou) and offered to the trade by Lebigot of Angers about 1859. About 1880 two variations of this form one with upright and one with pendulous branches were raised from seed of this form by Dr. G. Dieck, of Zöschen, Germany, for which I propose the following names as those given by Dieck are preoccupied.

Robinia pseudoacacia f. **dependens,** nom. nov.—*R. pseudo-Acacia monophylla pendula* Dieck in Ill. Monatsh. Gartenb. II. 104 (1883).—Hartwig, Ill. Gehölzb. ed. 2, 332 (1892), as var. *monophylla pendula.*—Voss, Vilmorin's Blumengärt. I. 218 (1894), as f. *monophylla pendula.*—Schneider, Ill. Handb. Laubholzk. II. 83 (1907), as var. *monophylla* f. *pendula.*—*R. Pseudacacia pendula monophylla* Zabel in Beissmer, Schelle & Zable, Handb. Laubholz-Ben. 270 (1903).

As the varietal name *pendula* given by Dieck to this form which may be considered a pendulous subform of *R. pseudo-acacia* f. *unifoliola* is preoccupied by *R. pseudo-acacia pendula* Loudon, a new name is proposed here.

Robinia pseudoacacia f. **erecta,** nom. nov.—*R. Pseudo-Acacia monophylla fastigiata* Dieck, Haupt-Cat. Zöschen, 65 (1885).—Hartwig Ill. Gehölzb. ed. 2, 332 (1892), as var. *monophylla fastigiata.*—Schneider, Ill. Handb. Laubholzk. II. 83 (1907), as var. *monophylla* f. *fastigiata.*

The varietal name fastigiata given by Dieck to this form is preoccupied by *R. pseudoacacia fastigiata* Neumann[12] and therefore a new name is proposed here.

× **Robinia Slavinii** (*R. Kelseyi* × *Pseudoacacia*), **hybr. nov.**

Small tree: young branchlets slightly and sparingly villose at first, soon glabrous, slightly zigzag, red-brown at the end of the first season, with few, short and straight prickles. Leaves 9–17-foliolate; leaflets oblong-elliptic to oblong-ovate or narrowly oblong-ovate, the lower ones usually smaller and more or less ovate, 2.5–5 cm. long and 1.2–2.2, rarely to 2.4 cm. broad, obtuse or sometimes emarginate, rarely acutish, mucronulate, glabrous, except slightly pubescent on the midrib beneath when young, yellowish green above, pale green beneath, firm at maturity; petioles 2–3 cm. long, like the rhachis very slightly pubescent when young, soon glabrous. Racemes 6–10-flowered, rather loose, with the peduncle 8–13 cm. long; peduncle 2.5–3.5 cm. long, like the rachis slightly and loosely villose and eglandular; pedicels 3–6 mm. long, slightly or sometimes more densely villose, and rarely with a few solitary glands; calyx broad-campanulate, 0.8–1 cm. high, the lower lip divided nearly to the middle into ovate long-acuminate lobes or less deeply divided with triangular-ovate acute lobes, the upper lip less than half as deeply divided, finely and thinly villose; corolla about 2.5 cm. long, rosy-pink, standard rounded, emarginate, about 2 cm. across, wings oblong, without the claw 1.8 long and 8

[12] *R. pseudo-acacia fastigiata* Neumann in Horticulteur Franc. 1857, 222. This is described by the author as a form very similar to *tortuosa;* all the branches ending in a ramification, the leaves long and pendent of a very glaucous color, the large branches somewhat spiny and very short. It is not the *R. pseudacacia* var. *fastigiata* Lemaire which is a synonym of *R. pseudoacacia* f. *pyramidalis* Pepin (in Rev. Hort sér. 2, IV. 240 [1845].—*R. pyramidalis* Poiteau in Ann. Soc. Hort. Paris, XXXI. 171 [1842].—*R. inermis pyramidalis* Schickler in Gartenfl. VI. 97, t. 190 [1857].—Neubert in Deutsch. Mag. Gart.-Blumenk. 1857, 70, fig.—*R. pseudoacacia* var. *fastigiata* Hort. apud Lemaire in Ill. Hort. VI. misc. 20, fig. [1859].—Morren in Belg. Hort. XIV. 27, fig. [1864].—Bean in Gard. Chron. ser. 3, XLI. 151, fig. 69 [1907]).

mm. broad, keel 1.5 cm. long without the claw; staminal tube 1.5 cm. long; ovary tuberculate, the tubercles occasionally with a hair-like appendage. Pod 5–6 cm. long and about 1 cm. broad, roughened by small tubercles partly bearing short prickles less than 1 mm. long; seeds about 4 mm. long, obliquely ellipsoid, slightly compressed, dull olive-green, mottled with black.

Cultivated at Rochester, New York; specimen examined: Durand-Eastman Park Nursery, June 6 and July 30, 1919, June 4 and October 10, 1920, B. H. Slavin (No. 3, type, and No. 4; flowers and fruit; Nos. 1, 2, 5 and 6; flowers and mature leaves).

This new hybrid originated at the Durand-Eastman Park, Rochester, New York, from seed of *R. Kelseyi* Hutchins, collected in 1914 by Mr. B. H. Slavin. From this species the hybrid is easily distinguished by the larger and broader often obtuse and even emarginate leaflets, by the larger raceme with a slightly villose rhachis destitute of glandular hairs, by the broader calyx and by the fruit entirely destitute of glandular hairs being only roughened by minute tubercles. From *R. Pseudoacacia* L. which is without doubt the other parent it differs chiefly in the narrower, generally ovate-oblong leaflets often acutish and but rarely emarginate, nearly glabrous when unfolding, in the shorter comparatively few-flowered racemes, shorter pedicels, rosy pink flowers and in the tuberculate fruit. It has some resemblance to *R. Margaretta* Ashe, which possibly is a hybrid between *R. Pseudoacacia* and *R. hispida*, but *R. Margaretta* may be distinguished by the broader, obtuse leaflets silky pubescent beneath when young and by the longer racemes with a sparingly glandular-pilose rhachis and pedicels.

Robinia Slavinii is apparently similar in general appearance to *R. Kelseyi* but of more vigorous growth and is tree-like in habit; if the rosy-pink flowers are produced as profusely as in *R. Kelseyi*, it will be a desirable ornamental plant.

× **Robinia ambigua** Poiret in Encycl. Méth. Suppl. IV. 690 (1816) (*R. pseudoacacia* × *viscosa*).—*R. dubia* Foucault in Jour. Bot. Appl. II. 204 (1813), not Poiret.—*R. hybrida* Audibert ex De Candolle, Prodr. II. 262 (1825), as synon.—*R. intermedia* Soulange-Bodin in Ann. Soc. Hort. Paris, II. 43 (1828).

This hybrid Robinia was raised from seed of *R. viscosa* by Emmanuel de Foucault and flowered for the first time in 1812. The name *R. dubia* which has been used by most authors for this form, should be replaced by *R. ambigua* on account of the older *R. dubia* Poiret (in Encycl. Méth. VI. 227) of 1804 which must be considered a valid name from a nomenclatorial point of view, though it is now referred to the genus Sabinea. Loudon and also Schneider and A. Henry mention as possibly belonging here *R. echinata* Miller, Dict. ed. 8 (1768), but the descriptive phrase "leguminibus echinatis" hardly applies to this hybrid, and, moreover, *R. viscosa* Vent. one of its supposed parents was not introduced until

1797, though a tree growing in the garden of the Bishop of London at Fulham which Miller refers to his *R. echinata* and describes as having much shorter pods densely beset with short prickles but otherwise resembling *R. pseudo-acacia* may have been *R. viscosa;* the fact that this tree "produced plenty of seeds" also speaks against its hybrid nature. Even if the identity of the Fulham tree should be established, the name *R. echinata* could not be applied to it as it is based primarily on Boerhaave's *Pseudoacacia vulgaris* which is partly *Robinia pseudoacacia* (as to Tournefort's name), while the other citations refer to a tree figured by Cornut (Canad. Pl. Hist. 172) which has subsessile flowers and one-seeded spiny legumes and is not a Robinia.

The adoption of the name *R. ambigua* makes necessary the following new combination.

Robinia ambigua var. **bella-rosea,** comb. nov.—*R. bella-rosea* Nicholson, Dict. Gard. III. 310 (1887).—Mottet, Dict. Hort. IV. 515 (1896–7).—*R. viscosa* f. *bella-rosea* Voss, Vilmorin's Blumengärt. I. 219 (1894).—*R. dubia* var. *amoena* Hort. apud Mouillefert Arb. Arbriss. I. 567 (1894).—*R. pseudo-acacia* var. *bella-rosea* Cowell in Bailey, Cycl. Am. Hort. IV. 1538 (1902).—*R. dubia* var. *bella-rosea* Rehder in Mitteil. Deutsch. Dendr. Ges. XXIV. 223 (1915).

This form is nearer to *R. viscosa* while the typical *R. dubia* is closer to *R. pseudoacacia.* When and where this form originated I have not been able to find out, but it must have originated before 1880, for in 1883 it was in cultivation at Kew, as specimens in the herbarium of the Arnold Arboretum collected in that year by G. Nicholson show. If *R. viscosa bellidiflora* Hort. apud Eismann in Hamburg. Gart. Blumenzeit XXXIV. 117 (1878) belongs here, is doubtful.

Caragana frutex K. Koch var. **macrantha,** nom. nov.—*C. frutescens* var. *grandiflora* Rehder in Bailey, Cycl. Am. Hort. I. 242 (1900), not Regel (1866).—*C. frutex* var. *grandiflora* Koehne Herb. Dendr. no. 514 (1904), in sched.—Schneider, Ill. Handb. Laubholzk. II. 103, fig. 64w-y (1907).—Komarov in Act. Hort. Petrop. XXIX. 226 (1908).—Rehder in Bailey, Stand. Cycl. Hort. II. 160 (1914).

As the name *C. frutescens* var. *grandiflora* Rehder is preoccupied by *C. frutescens* var. *grandiflora* Regel in Bull. Soc. Nat. Mosc. XXXIX. 570 (1866) it is not a valid varietal name and must be changed even though Regel's varietal name, which is based on *C. grandiflora* DC. is generally referred as a synonym to that species which is kept distinct by most authors or referred to *C. pygmaea* as a variety. *Caragana frutex* var. *macrantha* occurs apparently occasionally with the type for one branch of a specimens collected by P. N. Krilof near the village Lokot, western Siberia, on May 14–16, 1901, represents this form, while the other is typical *C. frutex.*

Desmodium Franchetii, nom. nov.—*D. cinerascens* Franchet, Pl. Delavay. 174 (1890), not A. Gray.

Franchet's name for this species cannot stand on account of the older *D. cinerascens* A. Gray (Pl. Wright II. 48 [1853]), a Mexican species of the Sect. Heteroloma. *Desmodium Franchetii* seems most closely related to *D. tiliaefolium* G. Don, but differs according to Franchet's description chiefly in the smaller obtuse leaflets rounded at the base, in the deltoid-lanceolate calyx-teeth as long or longer than the tube and in the standard being somewhat longer than the wings.

Desmodium spicatum, nom. nov.—*D. tiliaefolium* Craib in Sargent, Pl. Wilson II. 104 (1914), not G. Don.—*D. cinerascens* Hutchinson in Bot. Mag. CXLV. t. 8805 (1919), not Franchet nor A. Gray.

As already pointed out by Mr. Hutchinson in the Botanical Magazine the specimens of Desmodium from western Szech'uan referred to *D. tiliaefolium* do not belong to that species, but his identification of the plant from western Szech'uan with *D. cinerascens* Franchet does not seem to be correct. Though I have not seen the type specimen of Franchet's species, his description differs in several important characters, as in the short-attenuate obtuse leaflets, in the terminal panicle with pubescent branches, and in the calyx divided to the middle or below into deltoid-lanceolate teeth. In *D. spicatum* the leaflets are not attenuate at the apex, the inflorescence is an unbranched spike and the calyx-teeth are broadly ovate, shorter than the tube and subacute or obtuse; occasionally the terminal spike may be augmented by lateral spikes at its base, but these lateral spikes are in the axils of foliage leaves and do not form a part of the terminal spike proper.

As stated by Mr. Hutchinson the plate in the Botanical Magazine was prepared from material sent by Miss Willmott from Warley Place and raised from Chinese seed collected by Mr. E. H. Wilson. He probably collected the seed in western Szech'uan in one of the localities where he collected the species in flower under Nos. 2936, 2937 and 2940 of his herbarium collection. The plant introduced by M. de Vilmorin in 1896 and distributed as *D. cinerascens* also represents *D. spicatum*, as specimens show which I collected in 1911 in Vilmorin's Fruticetum at Les Barres and in Chenault's nursery at Orléans.

MISCELLANEOUS GENERA

Pinus resinosa Sol. f. **globosa,** forma nova.

A typo recedit habitu humiliore densa globosa, foliis paulo tenuioribus.

Hort. Mrs. George A. Carpenter, Wolfeboro, New Hampshire; herbarium specimens collected March 23, 1921, and photographs of the original plants preserved at the Arnold Arboretum.

Three plants of this distinct and handsome form were found in the woods near Wolfeboro, New Hampshire and transplanted to the grounds of Mrs. George A. Carpenter. They are now approximately 20 to 25 years old and 5½ to 8 feet tall forming dense globose heads about 8½ feet in diameter. The leaves are as or nearly as long as in the typical form but slenderer. It has not yet produced cones.

This is the first variation known of *P. resinosa* Sol. and therefore of interest. Young plants grafted from the original plants are growing at this Arboretum.

Ulmus americana L. f. **columnaris** f. nov.

A typo recedit ramis erectis columnam satis angustam formantibus. — Ramuli juveniles pubescentes; folia elliptica, 7–14 cm. longa 4–7.5 cm. lata, basi valde obliqua, dupliciter argute serrata supra adpresse scabropilosa, subtus secus costam et in venis venulisque pilosa; petioli pubescentes, 2–3 mm. longi.

NEW YORK: Conesus Lake, Livingston County; specimens collected June 10, 1911, by R. E. Horsey and T. Malloy and photographs taken by R. E. Horsey at the same date and earlier in a nearly leafless state state are preserved in the herbarium and in the photograph collection of the Arnold Arboretum.

This very distinct columnar form of the American Elm was discovered by Mr. John Dunbar; the tree is standing inside a garden wall near the roadside and is about 20 m. tall with a columnar crown about 6 m. in diameter, of almost equal width from the base to the top which is flattened, ending in many branches of nearly equal height; the trunk measures 0.75 m. near the base and divides somewhat below the middle into several strong limbs ascending at a very acute angles. The leaves differ from those of the common form in being rather broad, measuring up to 7.5 cm. in width, very sharply and deeply doubly serrate, scabrous above, pilose on the veins and veinlets beneath and very unequal at the base; the petioles are very short, not exceeding 3 mm. in length and the young branchlets are pubescent.

Another tree of nearly similar habit is growing in Seneca Park, Rochester, New York, of which a photograph taken by R. E. Horsey on September 1, 1920, is in the collection of the Arnold Arboretum.

There is no earlier record, as far as I know, in botanical or horticultural literature of a columnar form of the American Elm, while the pendulous form was distinguished as early as 1789 by Aiton as *U. americana* var. *pendula*.

Aristolochia durior Hill, Twenty-five New Pl. 9, t. 24 (1773). — Rehder, Bradley Bibliog. II. 182 (1912). — *A. macrophylla* Lamarck, Encycl. Méth. I. 255 (1783). — *A. Sipho* L'Heritier, Stirp. Nov. 13, t. 7, 7b (1784 [1785]).

Hill's name for the plant now generally known as *Aristolochia macrophylla* Lamark seems to have entirely escaped notice; it does not appear in Index Kewensis and no mention of it can be found in literature elsewhere until I enumerated it in the Bradley Bibliography in 1912. As

it antedates Lamarck's name by 10 years, its resurrection cannot be avoided, though one has to concede that neither Hill's description nor his figure are very good, but they are sufficient to identify the plant; on the plate the leaves and the habit of the plant are fairly characteristic and represent unmistakably the *A. macrophylla* Lam., but the flowers show little resemblance to those of that species and look more like badly drawn flowers of *A. Clematitis* L.; the author apparently had at his command only a specimen without well developed flowers and probably reconstructed them on the lines of those of the well-known *A. Clematitis*.

It may not be amiss to append here a note on another American shrub figured by Hill on plate 18 of the same work. This is *Viburnum lanceolatum* which is referred in Index Kewensis as a synonym to *V. obovatum* Walt. and in Steudel's Nomenclator to *V. laevigatum* Ait., a synonym of *V. obovatum*. If this identification were correct, then *V. lanceolatum* first published by Hill in his Hort. Kew. 457, t. 19 (1768) would have priority over *V. obovatum* Walter of 1788, but the figure published with the original description, of which that in his Twenty-five new plants is only an enlarged copy, represents without doubt *V. nudum* L. and therefore *V. lanceolatum* Hill becomes a synonym of that species.

Hydrangea opuloides var. **japonica** Schneid. f. **coerulea**, comb. nov. — *H. Belzonii* Siebold & Zuccarini, Fl. Jap. I. 109, t. 55 (1840). — *H. japonica* var. *β. caerulea* Hooker in Bot. Mag. LXXII. t. 4253 (1846). — *H. Hortensia* β. *coerulea* K. Koch, Hort. Dendr. 106 (1853). — *H. japonica* E. *coerulescens* Regel in Gartenfl. 290 (1866). — *H. Hortensia α. Belzonii* Maximowicz in Mém. Acad. Sci. St. Pétersb. X. no. XVI. 14 (1867). — *H. opulodes* a. *japonica* f. *Belzonii* Voss, Vilmorin's Blumengärt. I. 287 (1894). — Schneider, Ill. Handb. Laubholzk. I. 392 [*opuloides*] 1905). — Rehder in Bailey, Standard Cycl. Hort. III. 1621 (1915), as var. of *H. opuloides*. — *H. hortensis* var. *Belzonii* Rehder in Bailey, Cycl. Am. Hort. II. 784 (1900).

This blue-flowered form of *H. opuloides* var. *japonica* seems to be one of the hardiest forms of this species and is doing well on Long Island where it is reported to be a great favorite in gardens. It is half-hardy in the Arnold Arboretum, being killed back more or less every year, but enough of the old wood is usually left to produce flowers which appear at the end of lateral branchlets on the branches of last year. This and *H. opuloides rosalba* Rehd. are the only forms fairly hardy in this Arboretum; *H. opuloides cyanoclada* Dipp. persista, but does not flower.

Vitis Slavinii (V. *Lecontiana* × *vulpina*), hyb. nov.

Young branchlets glabrous or nearly so. Leaves orbicular-ovate in outline, 8–14 cm. long and 8 or 9 to 13 cm. broad, deeply cordate at base with a wide open sinus, 3–5-lobed, the lobes unequally coarsely dentate, with broad triangular or rounded, acute or abruptly mucronulate teeth much broader than long, the upper lobes broad-ovate or sometimes

triangular-ovate, the sinuses or at least the two upper sinuses broad and rounded reaching nearly halfway to the base, rarely shallow, dark green and glabrous above, light green beneath, thinly floccose-villose over the whole surface or pilose or villose only on the veins and veinlets, rarely nearly glabrous at maturity; petioles 4–12 cm. long, sparingly villose or pilose chiefly in the grove, or nearly glabrous. Flowers not seen. Fruit in long narrow panicles without the peduncle 5–7.5 cm. long and 3–3.5 cm. across; berries globose or depressed-globose, 0.9–1.3 cm. in diam. blue-black, bloomy, slightly acid; seeds 1–4, ovoid, 5–6 mm. long, with a small chalaza.

NEW YORK: Banks of Genesee River, Seneca Park, Rochester, August 30, 1920, *B. H. Slavin* and *R. E. Horsey* (type); September 15, 1920 *B. H. Slavin*, August 9, 1913, *B. H. Slavin*.

There can be little doubt that this Grape Vine is a natural hybrid between *V. Lecontiana* House (*V. bicolor* Le Conte, not Raf.) and *V. vulpina* L., as both those species grow in the locality where Mr. Slavin discovered this form which is clearly intermediate between the two species. From *V. Lecontiana* the hybrid is easily distinguished by the greenish or grayish green, not whitish under side of the leaves, their coarser more prominent serration and their usually smaller size. From *V. vulpina* it differs chiefly in the partly deeply lobed leaves with rounded sinuses, the shorter much broader teeth and in the more or less pubescent and somewhat grayish green under side of the leaves and the narrower and slenderer fruiting panicle. Some specimens as those collected on August 9, 1913, and one of the two collected September 15, approach more closely *V. vulpina* in their only shallowly lobed leaves slightly pubescent beneath along the veins, but the influence of *V. bicolor* is shown by the much broader and shorter teeth and the acute narrow basal sinus of the leaves.

× **Vitis Andersonii** (*V. Coignetiae* × *vulpina*), hybr. nov.

Young branchlets at first covered with a floccose tomentum soon becoming glabrous or glabrescent, or nearly glabrous from the first. Leaves broadly triangular-ovate, 10–20 cm. long and about as broad, 3-lobed, with broadly triangular acuminate lobes, coarsely and very unequally toothed with broad triangular acute, or short-acuminate and mucronulate teeth, the sinus deep and broad its sides diverging at an acute or right angle, rarely at an obtuse angle with nearly truncate base, densely floccose-tomentose while young or only slightly cobwebby and pubescent on the veins and veinlets beneath, at maturity covered beneath on the veins and veinlets with long-lanuginose hairs or only pilose on the veins and larger veinlets; petioles 3.5–7 cm. long, with a floccose-tomentose pubescence while young or pilose particularly toward the apex, sometimes glabrous or nearly so. Flowers not seen. Fruiting panicle rather small, 4–7 cm. long, berries globose, 1–1.2 mm. diam., bluish black and bloomy; seeds obovoid 6–7 mm. long, light grayish brown with a narrowly obovate small chalaza in the middle of the seed.

Originated in the garden of Mrs. Bayard Thayer at Lancaster, Massachusetts. Specimen examined: Hort. Bayard Thayer, Lancaster, Mass., July 27, 1920, *C. S. Sargent* (type); Arnold Arboretum, July 29, August 25 and September 28, 1920, *Alfred Rehder.*

This hybrid was raised by Mr. William Anderson, gardener to Mrs. Bayard Thayer at Lancaster, Mass., from seed of *Vitis Coignetiae* Planch. apparently fertilized by a nearby *V. vulpina* L. I have specimens of both parent plants before me; the *V. Coignetiae* is not the typical densely tomentose form but the var. *glabrescens* Nakai which at maturity is only very thinly covered by a cobwebby tomentum, so that the under side appears grayish green or greenish and not densely rusty-tomentose; the *V. vulpina* is typical in the shape and serration of the leaves, but the veins and stronger veinlets beneath are pilose. From *V. Coignetiae* the new hybrid is easily distinguished by the smaller more deeply 3-lobed leaves, the coarser serration with triangular, acute or short-acuminate teeth and by the very slight or entirely absent floccose tomentum on the under side of mature leaves. From *V. vulpina* it differs chiefly in the usually larger less deeply 3-lobed leaves, in their narrower basal sinus its sides diverging at an acute or right angle, in the broader and shorter scarcely acuminate teeth and in the more pubescent under side. The different plants of this hybrid show a great variation and represent almost all intermediate stages between the two parent species; some being so near to *V. vulpina*, that they can only be distinguished from it by the narrow basal sinus of leaves, very wide and nearly truncate near the petiole in *V. vulpina.*

Cornus Dunbarii (*C. asperifolia* × *macrophylla*), hybr. nov.

Tall shrub; becoming tree-like, with upright or ascending branches young branchlets slightly quadrangular with sparse short appressed hairs, dull purple the second year and usually soon becoming brown and developing numerous short longitudinal fissures. Leaves elliptic-ovate to oblong-ovate, 6–12 cm. long or on vigorous shoots to 16 cm. long, 2.5–6 cm. broad, long-acuminate, broad-cuneate or rounded at the base, dark yellowish green above and slightly rough from short hairs, glaucous beneath, rather densely covered with loosely appressed or partly slightly spreading, straight or partly curved hairs, with 5–7 pairs of veins prominent and yellowish beneath, like the midrib furnished with sparse appressed or slightly spreading hairs or nearly glabrous; petioles 1–2 cm long, with short appressed hairs. Flowers in rather dense often slightly paniculate corymbs 5–6.5 cm. across; peduncle 3–3.5 cm. long, minutely appressed pubescent with short fulvous hairs, the branchlets of the corymb more densely pubescent with similar but whitish and partly slightly spreading hairs; pedicels very short; ovary densely appressed-pubescent; calyx-teeth subulate to 0.5 mm. long, exceeding the disk; petals oblong-lanceolate, 3.5–4 mm. long; filaments slightly shorter; style 2.5–3 mm.

long, sparingly appressed pubescent, not thickened below the apex. Fruits unknown. Fruit sparingly produced, subglobose, 5–6 mm. thick blue or rather light blue, appressed-setulose; stone slightly higher than broad, 4 mm. long and 3.75 mm. wide, slightly compressed and slightly oblique, faintly ribbed.

Cultivated at Highland Park, Rochester, New York and in the Arnold Arboretum; specimens seen: Highland Park, August 29, 1919, and July 9 and September 6 or 16, 1920, *Wm. L. G. Edson* (No. 0-1108, type), July 12, 1920 (No. 0-1105); August 29, 1919 (No. 0-1106); Aug. 29, 1919 and July 17, 1920 (No. 0-1109), and July 17, 1920 (No. 0-1110), *Wm. G. L. Edson;* Arnold Arboretum, September 13, 1921, *A. Rehder* (plants received from Rochester in 1916).

This hybrid originated in Highland Park at Rochester from seed of *Cornus macrophylla* Wall. (*C. brachypoda* C. A. Mey.), but differs from that species in the slenderer paler colored branchlets, in the narrower somewhat smaller leaves, rough above by short scabrid hairs, and beneath covered with more numerous longer less closely appressed and partly curved hairs, in the fewer more or less pubescent veins, (usually 7–8 in *C. macrophylla* and glabrous beneath), it further differs in the denser and smaller, more pubescent umbel-like corymb, in the pubescent style and in the blue fruit. In these characters the hybrid approaches *C. asperifolia* Michx. which is probably the other parent, but it differs from that species in the larger leaves, only slightly rough above, and beneath with nearly appressed pubescence, in the more numerous slightly appressed pubescent veins (in *C. asperifolia* 4–5 and furnished with spreading villose hairs), in the sparingly appressed pubescent inflorescence, in the longer sepals and longer petals and in the blue fruit.

Though this hybrid is not as handsome as *C. macrophylla* it has the advantage of being hardier and therefore may be recommended for regions where *C. macrophylla* will not stand the winter.

× **Cornus Horseyi** (*C. amomum* × *macrophylla*), hybr. nov.

Large shrub, with spreading branches, young branchlets slightly quadrangular with sparse short appressed hairs, becoming dark purple at the end of the season. Leaves elliptic-ovate to oblong ovate, 5–10 or on shoots to 12 cm. long, 2–5.5 cm. broad, long-acuminate, broadly cuneate or nearly rounded at base, dark yellowish green above and appressed-pubescent at first, soon glabrous, grayish green or pale green beneath sparingly furnished with straight appressed hairs, occasionally intermixed particularly toward the base of the leaf with fulvous hairs, with 5–7 pairs of veins, prominent beneath and slightly appressed-pubescent or nearly glabrous, the midrib beneath furnished with scattered appressed minute fulvous hairs, intermixed with pale hairs; petiole 0.5–2 cm. long, with minute appressed fulvous and pale hairs. Flowers in rather dense, convex or rather flat corymbs 5.5–6.5 cm. across; peduncle 3–4 cm. long

minutely and sparingly appressed-pubescent; the branches of the inflorescence with appressed or slightly spreading mostly pale hairs; pedicels 1–4 mm. long, appressed-pubescent; ovary densely whitish appressepubescent; calyx-lobes triangular and acuminate to ovate-oblong, exceeding the disk; petals oblong-lanceolate, 4.5–5 mm. long, not or slightly longer than filaments; style 3.5 mm. long, glabrous or with few scattered appressed hairs, usually more or less thickened below the stigma. Fruit sparingly produced, subglobose, 6–7 mm. thick, dark dull blue, appressed setulose; stone distinctly broader than high, about 4 mm. high and 5 mm. broad, oblique, slightly compressed, slightly ribbed.

Cultivated in Highland Park, Rochester, New York, and in the Arnold Arboretum; specimens examined: Highland Park, August 29, 1919, Horsey & Edson and July 13, 1920, *Wm. L. G. Edson* (No. 0–1104); Arnold Arboretum July 13, 1920, and September 13, 1921, *A. Rehder* (plants received from Rochester in 1916).

This new hybrid originated like the preceding in Highland Park, Rochester, from seed of *C. macrophylla*. From that species it differs in its slenderer branchlets, the smaller and narrower leaves, pale or grayish green, not whitish beneath, with fewer veins, in the presence of fulvous hairs on the petiole and on the under side of the leaf toward the base, the smaller slightly pubescent corymb and in the oblique stone distinctly broader than high. From *C. Amomum* it differs chiefly in the larger, long-acuminate leaves with more numerous veins, grayish green beneath and with pale not fulvous-pubescent midrib and veins, and in the less pubescent, somewhat larger and looser corymbs and darker-colored fruits. From the preceding hybrid, *C. Dunbarii*, it differs chiefly in the more spreading habit, more glabrous leaves smooth above, grayish green, not glaucescent beneath, in the glabrous or nearly glabrous longer style more or less thickened below the stigma, and in the larger, darker-colored fruit with the oblique stone distinctly broader than high.

This hybrid is not quite as handsome as *C. macrophylla*, but like the preceding hybrid apparently hardier and therefore to be recommended for regions where *C. macrophylla* is not hardy. Which of the two hybrids is to be considered superior in regard to its ornamental qualities remain to be determined; judging from the herbarium specimens *C. Dunbarii* seems to be a more vigorous shrub with larger leaves, while *C. Horseyi* seems to be more showy when in flower.

Hybrids of *C. macrophylla* possibly occur also in European gardens In the Botanic Garden at Muenden, Germany, I collected in 1895 a specimen named *C. macrophylla* which may be a hybrid between *C. macrophylla* and *C. sanguinea*, and in the Jardin des Plantes at Paris I found in 1901 a plant cultivated as *C. Thelycrania* which is probably of similar origin. The original *Cornus Thelycrania* is a synonym of *C. macrophylla* and a plant collected in Kew Gardens by G. Nicholson in 1882 under the probably corrupted name *C. Theleriana* is typical *C. macrophylla*.

× **Rhododendron holmleaense** *R. discolor* × ([*catawbiense* × ?]), hybr. nov.

Shrub: Young branchlets with scattered minute stipitate glands, soon glabrous; winter-buds ovoid to ovoid-oblong, pointed, to 3.5 cm. long, with many ovate, acuminate or mucronate greenish scales, puberulous outside, glabrous and lustrous inside except toward the apex, fimbriate on the margin with brown elongated glands and toward the apex with villose ferrugineous hairs. Leaves oblong-lanceolate to oblong-oblanceolate or elliptic-oblong, 8–15 cm. long, 3.5–5.5 cm. broad, acute or obtusish and mucronulate at apex, abruptly contracted and rounded at the base or sometimes broadly cuneate, dark green and finely impressed-reticulate above, pale grayish green or glaucescent beneath and finely reticulate with the areoles between the veinlets slightly elevated, glabrous except a very slight floccose tomentum on the upper surface when unfolding, with 12–16 lateral veins; petioles stout, 1–2 cm. long, stipitate-glandular at first, soon quite glabrous. Flowers in 10–15-flowered umbel-like racemes; rhachis 2–5 cm. long, glabrous; pedicels 2.5–4 cm. long, rather densely but minutely stipitate-glandular, calyx with broadly semiorbicular to nearly obsolete lobes, not more than 2 mm. high, minutely glandular-ciliolate, outside glabrous or very slightly stipitate-glandular; corolla rotate-campanulate, 7–9 cm. across, pale amaranth pink to nearly white the upper lip below the lobe with dark markings of Pompeian red to madder brown often confluent toward the base, or without any markings, lobes 5–6, semiorbicular to orbicular-ovate, about 3 cm. long or 3.5–4 cm. broad, rounded or slightly emarginate at apex and plane or slightly undulate at the margin, tube about 3 cm. long, slightly pilose inside stamens 10–12, very unequal, 2–3.5 cm. long, pilose on the lower third whitish; anthers ochraceous and 4 mm. long or more or less abortive; style 3.5–4 cm. long, reaching nearly to the middle of the upper lobe strongly curved upward near apex, stipitate glandular only at base or nearly the whole length, whitish, stigma capitate, broad and flattened; ovary stipitate-glandular sometimes interspersed with a few scattered hairs, usually 8-celled, sometimes 6–7-celled.

Cultivated at Holm Lea, Brookline, Mass., and at the Arnold Arboretum; specimens of several forms including the type collected at Holm Lea in May, 1921 (flowering in the greenhouse) and at the Arnold Arboretum on June 7, 1921, are preserved in the herbarium of the Arnold Arboretum.

This beautiful hybrid was raised by Charles Sander in 1915 at Holm Lea from *R. discolor* Franchet fertilized with the pollen of an unnamed hybrid seedling form of *R. catawbiense*. A large number of seedlings were raised of which some were almost indistinguishable from *R. discolor*, while others were clearly intermediate between that species and *R. catawbiense*. These intermediate forms differ from *R. discolor* in the generally smaller and comparatively broader leaves and shorter petioles, in the glandular pedicels, the 5- or 6-lobed corolla with a short much wider tube and usually spotted upper lip, in the 10–12 stamens more or less pilose toward the base and in the style being usually glabrous at

least above the middle. From *R. catawbiense* the hybrid differs chiefly in narrower more pointed leaves, in the glabrous rhachis, the glandular not villose longer pedicels, the usually or often 6-lobed corolla, the stamen with whitish filaments, often 12 in number and the, at least toward the base, more or less stipitate-glandular style, and in the usually 8-celled ovary. It seems rather remarkable that the ovary even in the flowers with ten stamens and a 5-lobed corolla should be usually 8-celled, while in regard to the number of the corolla-lobes and the stamens the influence of *R. discolor* is less strong.

Several forms have been raised, the one I consider the type of this hybrid group has large flowers 8–9 cm. wide, of amaranth pink color with a large blotch of partly confluent dots colored Pompeian red; the corolla is usually 6-lobed, the lobes with undulate margin and the number of stamens 12; the anthers are large, ochraceous and apparently well developed, the style is nearly glabrous, the leaves are generally oblong-lanceolate. This form is distinguished as "Charles Sander."

Other forms have light pink or nearly white flowers with fewer or almost no dots with the style glandular throughout or sparingly pilose below the middle and with sterile anthers in one case; in one form the leaves are broadly obovate to obovate-oblong.

In its large open flowers this hybrid is similar to *R. discolor* Franch., but it is hardier and for this reason a valuable addition to the number of hybrid Rhododendrons adapted for cold regions. Though not as resistant as the hardier hybrids of *R. catawbiense*, it has proved fairly hardy in the neighborhood of Boston having stood the last two or three winters in sheltered locations out-of-doors at Holm Lea and in the Arnold Arboretum and has flowered this year in both places; *R. discolor* in the same localities has suffered, and cannot be recommended for this latitude.

Rhododendron obtusum var. **arnoldianum** (var. *amoenum* × var. *Kaempferi*), var. nov.

This cross was raised at the Arnold Arboretum about 1910 from seed of *R. obtusum* var. *Kaempferi* Wils. fertilized by *R. obtusum f. amoenum* Wils. It is exactly intermediate in habit, in size and color of the flowers and in size, texture and persistency of leaves. From the var. *Kaempferi* it is distinguished by the lower denser habit, smaller, darker and more lustrous leaves, 2.5–4 cm. long, by the more numerous and broader persistent summer leaves below the winterbuds and by the smaller flowers 3–3.5 cm. across and in color between rosy mauve to nearly red (rosolene purple, rose color and rose dorée according to Ridgway) and by the shorter and broader sepals. From the f. *amoenum* the cross differs in the more upright habit, the larger acute, usually less lustrous and thinner leaves, in the less numerous and narrower summer leaves below the winter-buds, by the larger flowers with a normal calyx, and the slightly spotted corolla which is usually nearer to rose-color, rarely rosolene purple as in f. *amoenum*. The seedlings show some variation in the size of the

flowers and in their color as stated above and it is probably difficult or even impossible to distinguish them from certain forms of f. *japonicum*, the Kurume Azaleas, but as they are of different origin and have the advantage of being perfectly hardy in the climate of Boston, it seemed advisable to distinguish them by a definite name, commemorating their place of origin.

Cultivated at the Arnold Arboretum under No. 10932; specimens collected May 20, 1916, June 8, 1917, May 20 and October 12, 1918, and May 12, 1921 (No. 10932, a (type), b-d) are preserved in the herbarium of the Arnold Arboretum.

× **Ligustrum ibolium** Coe in litt. 1919 (*L. obtusifolium* × *ovalifolium*). — "Ibolium Privet" in Elm City Nursery Co. Price-list, 1921 41, fig.

Upright shrub; young branchlets puberulous, the pubescence chiefly in two opposite longitudinal rows, soon glabrous or nearly glabrous. Leaves elliptic-ovate to oblong-ovate, acute to acuminate, broadly cuneate at base, sparingly and finely pubescent above chiefly toward the midrib, glabrous or nearly so at maturity, pubescent on the midrib and sparingly on the veins beneath and with a few scattered hairs on the surface, glabrous at maturity except on the midrib; petioles glabrous or nearly so, 2–3 mm. long. Flowers in terminal, loose, pyramidal panicles 8–12 cm. long, usually leafy or with leafy bracts below, the lower lateral branchlets elongated, 3–6 cm. long; axes puberulous or nearly glabrous, the lateral ones sharply 4-angled; flowers nearly sessile; the calyx glabrous with truncate margin; corolla-tube about 5 mm. long, lobes short reflexed; anthers exserted, about as long as corolla-lobes; filaments partly exserted. Fruit subglobose, 5–7 mm. long, black, bloomy.

Cultivated in the Elm City Nurseries and in the Arnold Arboretum; specimens in herb. Arnold Arboretum: Elm City Nurseries, New Haven Conn., July 9, 1920 (No. 22, type, Nos. 1, 13, 37, 38, 41), November 16, 1917, and Nov. 10, 1919; Arnold Arboretum, July 13, 1920 (No. 13) and June 28, 1921.

This hybrid originated in the Elm City Nurseries, New Haven, Connecticut, about 1910. It is intermediate between the supposed parents *Ligustrum obtusifolium* Sieb. & Zucc. (*L. ibota* Sieb., not Blume)[1] and *L. ovalifolium* Hassk. From *L. ovalifolium* it is easily distinguished by the puberulous young branchlets and inflorescence, by the pubescence of the young leaves persistent on the under side of the midrib, while from *L. obtusifolium* it differs chiefly in the less pubescent, soon nearly glabrous branchlets, the larger, acute, never obtuse or obtusish glabrescent leaves, the glabrous calyx and the larger and looser inflorescence and in

[1] It is unfortunate that the now generally accepted name *Ligustrum ibota* Sieb. is to be superseded by *L. obtusifolium* Sieb. & Zucc., as *L. ibota* Sieb. though an earlier name, is a nomen nudum, having been published without any description or citation of a synonym and therefore uncertain to which of the several Japanese species it should be applied. The name *L. ibota* Siebold & Zuccarini of 1846 will then become the valid name for *L. ciliatum* Blume of 1850, a rarely cultivated species of little ornamental merit.

the more exserted anthers. The form considered the type is more similar to *L. ovalifolium*, but among the numerous seedlings raised of this hybrid, there are several, as Nos. 1, 37, and 38 which in the shape of the inflorescence and in habit are nearer to *L. obtusifolium*, but they differ in the glabrescent branchlets, leaves and inflorescence.

As an ornamental shrub and hedge plant it is superior to the popular California Privet (*L. ovalifolium*) on account of its greater hardiness and the fact that it branches more fully from the very base.

Viburnum dilatatum Thunb. f. **xanthocarpum**, f. nov.

A typo recedit fructu pallide luteo.

Cultivated at the Arnold Arboretum under No. 10140; specimens collected on September 13, 1921, preserved in the herbarium of the Arnold Arboretum.

This handsome new yellow-fruited form was received in 1919 from Mr. J. H. Bowditch of Pomfret, Conn., and fruited this year for the first time in the Arnold Arboretum. With its light yellow fruits it will prove a valuable addition to the Viburnums with ornamental fruits and forms a pleasing contrast to the typical V. dilatatum with dark red fruits.

(*To be continued*)

NOTES FROM AUSTRALASIA, III.

THE HOBART BOTANICAL GARDENS

E. H. Wilson

The Hobart Botanical Gardens adjoin the grounds of Government House and are situated on the right bank of the River Derwent about one mile from the business centre of Hobart city. The site is a hillside, roughly crescent-shaped, some 27 acres in extent, laid out in a series of terraces sloping toward the river, a fine tidal stream, about a mile wide at this point. The situation is decidedly good, the steep, sloping banks affording protection from winds. The soil is black diabase, rather heavy, of excellent quality though here and there it is shallow. Under the name Colonial Gardens the commencement appears to have begun in 1818[14] but little progress was made prior to 1828 when Governor Arthur appointed William Davidson to be the first superintendent, at a salary of £100 per annum with a ration and a house to live in. We are told that under Mr. Davidson the Gardens developed rapidly and that among other activities he gathered seeds of 150 species of native plants on the slopes and summit of Mt. Wellington to grow in the Gardens. By 1830 the area enclosed was about 13 acres and twelve gardeners and twelve of the convict chain-gang were employed in cultivating the garden and

[14] See "The foundation and early work of the Society" by E. L. Piesse in *Papers & Proceedings of the Royal Society of Tasmania* (1913).

cleaning the Domain. The Gardens became a popular resort and on the 19th of December, 1832, Governor Arthur directed that they be closed on Sunday, the superintendent having represented "the extreme inconvenience and injury which arises from the great number of persons who resort there on the Sundays." The expenditure during Governor Arthur's term of office was about £300 a year but it increased rapidly and in 1842 was over £800. This seems to have disturbed the authorities in London and in 1843 the Secretary of State informed the Governor, Sir Eardley Wilmit, that the gardens were no longer to be maintained at the public expense. An arrangement was made under which on October 14th, 1843, the Gardens were placed under the management of the newly organized "Botanical and Horticultural Society of Van Diemens's Land," the Government assisting with a small, annual grant of money. This arrangement was maintained until the end of 1885 when in exchange for other privileges the Society gave the gardens back to the Crown. That this Society with a small membership and little funds doggedly maintained the gardens is greatly to its credit and its zeal contrasts favorably with that of the Home Government who abandoned their charge soon after founding it. In 1845 Mr. F. W. Newman of Sydney was appointed superintendent and held the position until 1859. Newman appears to have been an energetic man and under him the gardens were extended, did much useful work, and grew rapidly in favour as a public resort. The annual number of visitors increased from 2287 in 1847 to 15725 in 1859, and in 1856 over 20 acres were under cultivation In 1857 a catalogue of the plants growing in the gardens was published by Newman. A copy of this interesting work is before me. The full title is *Catalogue of Plants in the Royal Society's Gardens, Queens Park, Hobart Town, Tasmania,* by Mr. F. W. Newman, Curator. It is arranged under ten headings viz: Trees and Shrubs, Climbers, Coniferae, Roses, Herbaceous Plants, Bulbs and Tuberous rooted plants, Annuals, Succulents, Fruit Trees, Agricultural Grasses, etc., is well printed and typographical errors are remarkably few. It contains the names of 1620 plants from all parts of the world. Some 70 kinds of Roses were cultivated and the Conifers number 135 of which 27 are Pines. The trees, shrubs and herbs of North America are well represented and it is evident that plants then being introduced to English gardens were quickly obtained for this garden in far off Tasmania.

On the death of Newman in 1859, Francis Abbott who had been apprenticed in the gardens was appointed superintendent and held the post until his death in 1903, then the post remained unfilled until 1911 when the present superintendent, Mr. John Wardman was appointed. Today, the Botanical Gardens are not a credit to the Government and people of Tasmania. Official parsimony long sustained has produced the inevitable results. The once rich collections are dwindling away and with them the usefulness of the gardens as testing and acclimatising

grounds and their attractiveness as a public resort. The staff consists of a Superintendent, head gardener, five laborers and one female clerk, and the total grant for maintainence, including all salaries is £1350 per annum. The annual rainfall of Hobart is only some 24 inches yet the only water supply of the gardens is 1050 ft. of 2-inch piping, a certain amount of 1-inch piping which does not function and a small pond virtually dry during the summer season. In 1920 the gardens were completely without water save that used for the few pot plants in the tiny greenhouses. The gardens need a 4-inch water-main and an annual allowance of £2500. They could then fulfill their functions properly and be a delight to visitors and residents.

The time of my visit was Easter, 1921, and being autumn most of the deciduous-leaved trees and shrubs were leafless. On a sloping flat near the superintendent's cottage some tiny lawns of Buffalo-grass were being kept green by aid of a sprinkler, and beds filled with Dahlias, Petunias Asters, Marigolds, Geraniums, Verbenas, Salvias, Penstemons, Delphiniums and a few other herbs were gay with flowers. A few belated Roses, a bed of Blue Hydrangeas and a fine clump of the rose-colored *Statice rosea* Sm. (*S. Dicksoniana* Hort.) from Natal were virtually the only other flowers. Some of the shrubs and small trees like the Barberries, Crabapples, Thorns and Service Tree were nicely in fruit. The garden everywhere was tidily kept, but in general it was virtually burnt up and except the lawns mentioned not a blade of green grass was to be seen. Many of the trees and shrubs were dead, more were dying and all for the want of water.

The collections, especially of woody plants, is still considerable, the labelling is creditably done, though, as might be expected the north hemisphere plants are often mis-named. Some of the larger groups like Conifers, Oaks, Thorns, Crabapples and their relatives are grouped together and a certain amount of geographical order is observed, there being beds devoted to New Zealand and Australian plants. The Conifers occupy the upper terraces and serve as windbreaks.

The entrance is through ornate iron gates approached from the main road by a short drive which is flanked by conifers and a few broadleaf shrubs and trees. The landscape effect of fairly steep hill-slopes laid out in terraces with winding paths and the broad river at the foot is decidedly good but over-crowding is a marked feature. On the whole the deciduous trees of the northern Hemisphere do not thrive. A few Thorns including the Washington Thorn (*Crataegus phaenopyrum* Med.) and Douglas Thorn (*C. Douglasii* Lindl.) flourish but not so well as the common English Hawthorn. Quantities of the English Oak (*Quercus robur* L.) have been planted in Tasmania but neither in the Botanic Gardens nor elsewhere does it grow into a handsome tree; it is stunted in habit and so too is the Red Oak (*Quercus borealis* var. *maxima* Ashe, *Q. rubra*

Auth., not L.). The best of the deciduous Oaks is *Q. cerris* L., the Turkey Oak. In the gardens are several good specimens of the Cork Oak (*Q. suber* L.), Holm Oak (*Q. Ilex* L.), the Himalayan *Q. incana* Roxb. and a fair tree of *Q. virginiana* Mill. The Olive (*Olea europaea* L.) does well and so too does the Wych Elm and the Common Ash (*Fraxinus excelsior* L.), but the Horsechestnut, Sweet Chestnut and Linden do badly. Maples do not thrive though there is a fair collections of nice trees of the Norway Maple. The Bull Bay (*Magnolia grandiflora* L.) does well but the deciduous Magnolias are far from happy. A magnificent *Photinia serrulata* Lindl., 30 feet tall with a spread of 30 feet, is one of the features of the gardens and there are also excellent examples of the New Zealand Cabbage Tree (*Cordyline australis* Hook. f.). Among the Palms good specimens of *Phoenix canariensis* Hort., *Jubaea spectabilis*, H. B. K., *Trachycarpus excelsa* Wendl., *Chamaerops humilis* L., and its variety *elegans*, *Cocos capitata* Mart. and *Washingtonia filifera* Wendl. are growing. Among shrubs are many sorts of Bush Honeysuckle, more or less happy, several Barberries including *Berberis vulgaris* L. heavily laden with scarlet fruit and a few Viburnums among which *Viburnum prunifolium* L. was noteworthy. The Common Box (*Buxus sempervirens* L.) is used as an edging and the Himalayan *Cotoneaster Simonsii* Bak. is used for making hedges and does splendidly. Near the small museum flourishes the largest specimen of the remarkable Elephant's Foot (*Testudinaria elephantipes* Salisb.) I have ever seen.

As a group the Conifers, especially the Pines, are the most interesting trees in the Hobart Botanic Gardens. Among those of the southern Hemisphere only *Araucaria excelsa* R. Br. (Norfolk Island Pine), *A. Bidwillii* Hook. (Bunya-Bunya), *A. Cunninghamii* Sweet (Hoop Pine), the South American *Podocarpus andina* Poepp. (*Prumnopitys elegans* Phil.), and the South African *P. elongata* L. Herit. are really thriving But the conifers of the north Hemisphere are more at home. Pines in particular do well and there are many really noteworthy specimens in the gardens. Among them a magnificent *Pinus muricata* Don, 60 feet tall with a trunk 9 feet in girth, in perfect health, a wide-spreading *P. Montezumae* Lamb., 45 feet tall and a trunk 7 feet in girth, *P. longifolia* Roxb., 75 feet and 7 feet in girth of trunk and a fine *P. Sabiniana* Dougl., 75 feet by 6 feet in girth are the finest I have seen in Australasia. There are handsome trees 80 feet tall of *P. ponderosa* Dougl. labeled *P. Benthamiana* and equally fine trees of *P. canariensis* C. Sm. The Austrian Pine (*P. nigra*) does badly, the Corsican (*P. nigra* var. *Poiretiana* Schneid., *P. laricio* Poir.) and *P. ponderosa* moderately well. There are fair trees of *P. Jeffreyi* Balf. and of *P. pinaster* Ait. (Cluster Pine), a splendid Stoe Pine (*P. pinea* L.), 50 feet tall with a wide-spreading flattened crown and a trunk 8 feet in girth. The Monterey Pine (*P. radiata* Don) flourishes as elsewhere in Australasia, our White Pine (*P. Strobus* L.) does indiffer-

ently but the Bhotan Pine (*P. excelsa* Wall.) thrives. There are also nice trees of *Pinus Coulteri* Don and of the Himalayan *P. Gerardiana* Wall., both coning freely, but a tree of the beautiful *P. patula* Schiede, 40 feet tall and 6 feet in girth of trunk was dying at the top from drought. The Douglas Fir (*Pseudotsuga taxifolia* Brit.) is not happy and of the Spruces and Firs only the Himalayan *Picea Smithiana* Boiss. (*P. morinda* Link) and the Spanish *Abies pinsapo* Boiss flourish. Of these there are fine trees from 50 to 75 feet tall perfect from the ground up. The Crimean *Abies Nordmanniana* Spach and the Himalayan *A. pindrow* Spach do fairly well but the Norway and Sitka Spruces merely exist. None of the Japanese conifers appear to grow well except the variety *elegans* of *Cryptomeria japonica* Don. The Cupressus do well and there are excellent specimens of *Cupressus torulosa* Don and *C. sempervirens* L. and quite good ones of *C. macrocarpa* Hartw. and of the chinese *C. funebris* Endl. The Lawson Cypress (*Chamaecyparis Lawsoniana* Parl.) does very well and so do the Atlas Cedar (*Cedrus atlantica* Manetti) and the Deodar (*C. deodara* Loud.). The Redwood (*Sequoia sempervirens* Endl.) looks very miserable but its relative the Mammoth Tree (*S. gigantea* DC.) is represented by several fine specimens including one fully 60 feet tall and 11 feet in girth of trunk. Several species of Juniper are cultivated and among them shapely trees of *J. drupacea* Labill. and *J. excelsa* Bieb. In the rosary are old rose bushes fifty years old and among them is growing a healthy young tree of *Cunninghamia lanceolata* Hook. This is not an attempt to enumerate all the treasures growing in these old gardens but what has been said is sufficient proof of their interesting character. The fine trees of rare Pines are in themselves worth a long journey to see.

HOBART, TASMANIA, *April*, 1921.

NOTES

William Purdom.—News has been received of the death, at Peking, after a short illness on November 7, 1921, of WILLIAM PURDOM, an English gardener, who from 1909 to 1912 made extensive journeys in Chili, Shansi, Shensi and Kansu, to collect material for this Arboretum. Purdom returned to China in 1914 and became associated with the late Reginald Farrar, spending nearly two years with him in collecting plants and seeds in Kansu and the Kokonor region. In 1916 he was appointed to a post in the Chinese Government Forestry Bureau and was later employed by the Ministry of Communications to organize a system of tree-planting by the Chinese Railways, establishing at this time the now flourishing Kin Han Railway forestry station. At the time of his death Purdom was engaged in the organization of a comprehensive forest survey for the Chinese Railways. By botanists Purdom will be remembered by *Ber-*

beris Purdomii Schneider, *Rhododendron Purdomii* Rehder & Wilson, *Prunus Padus pubescens* forma *Purdomii* Koehne, and *Leptodermis Purdomii* Hutchinson.

The following plants first introduced by Purdom have been raised at the Arboretum: *Larix dahurica* var. *Principis-Ruprechtii* Rehder & Wilson, *Picea Meyeri* Rehder & Wilson, *Abies sutchuensis* Rehder & Wilson, *Berberis circumserrata* Schneider, *Berberis Dielsiana* Fedde, *Berberis Gilgiana* Fedde, *Berberis Vernae* Schneider, *Deutzia hypoglauca* Rehder, *Deutzia grandiflora* Bunge, *Indigofera Potaninii* Craib, *Caragana Maximowiczii* Komarov, *Rosa bella* Rehder & Wilson, *Malus baccata* var. *gracilis* Rehder, *Malus robusta* var. *persicifolia* Rehder, *Malus transitoria* Schneider, *Prinsepia uniflora* Batalin, *Paeonia suffruticosa* var. *spontanea* Rehder (Moutan), *Cotoneaster gracilis* Rehder & Wilson, *Viburnum kansuense* Batalin, *Daphne Giraldii* Nitsche.

Purdom sent to the Arboretum 550 packages of the seeds of trees and shrubs; and in the Arboretum Herbarium there are specimens collected by Purdom under eleven hundred numbers.

E. H. Wilson in East Africa.—The following notes on some of the important trees of East Tropical Africa are from a letter recently received from Mr. Wilson and written at Monbasa on his return to the coast from a journey in the mountain forests of the interior, undertaken for the purpose of gathering material and information for the Arboretum. From Monbasa Mr. Wilson intended to continue his journey southward via Beira to Rhodesia and Cape Town. From Cape Town he will sail for England, with the intention of being back in the early summer at the Arboretum at the end of his two years' journey.

"The tallest broadleaved tree in the forests west of Nairobi is a species of Mimusops which often exceeds 150 ft. in height. It is smooth-barked with a buttressed bole free of branches for a hundred feet or more and the crown is sparse. Next in height among this class of trees is *Pygeum africanum* Hook. f., a handsome tree fully 120 ft. tall. This tree has reddish wood of good quality, a rough dark bark, a flattened round crown, lustrous dark green leaves and a buttressed bole free of branches for two-thirds the height of the tree. The most valuable of all the broadleaved trees of British East Africa is the so-called East African Camphor (*Ocotea usambarensis* Engl.), a truly magnificent tree. It grows about 100 ft. tall and has a wide-spreading flattened crown of massive branches. The bole is clean for from 50 to 75 ft. and is from 15 to 25 ft. in girth, slightly buttressed at the base and clothed with dark scaly bark which is red-brown beneath. The wood is pale- to rich-brown, fragrant, smelling slightly of camphor. This tree favors the tops and slopes of steep ridges and the lumber is difficult to obtain. These three trees are inhabitants of the rain-forest though the two first-named extend into semi-dry regions. Other large trees of these forests are *Ochna* sp., *Panax* sp., *Weihea africana*

Benth., *Rapanea rhododendroides* Mez, *Allophyllus abyssinicus* Radlk., *Heptapleurum* sp. and *Ficus Hochstetteri* Rich.—the last two usually comence life as epiphytes and ultimately completely enclose and strangle their hosts.

In the dry and semi-dry forests *Olea chrysophylla* Lam. and *O. Hochstetteri* Bak. are prominent trees of good size which yield valuable hardwood. In the dry regions, flat-topped Acacias in several species are a feature of the landscape and often form pure and extensive stands especially in savannah regions. In and round Mombasa grow many gigantic Baobabs (Adansonia) and the Doum Palm (Hyphaene) with its much-branched trunk is also common. In the neighborhood of Nairobi a Croton and a Tree Composite are characteristic trees. The Croton (*C. Elliotianus* Baill.) has horizontal branches and a flattened crown suggestive of Japanese trained trees. The Composite (*Brachylaena Hutchinsii* Hutchins.) is a tree with dioiceous flowers, often over 100 ft. tall by 15 to 20 ft. in girth of trunk, and so far as I know is by far the largest composite in the world. It has a fluted trunk, gray bark and a crown of nondescript shape. The wood is brownish, fragrant and burns with clear flame leaving very little ash. The wood is elastic and easily polished and would serve for the floors of ball-rooms.

The moorland vegetation has characteristics all its own and is quite unlike that of other countries I have visited. Tree Lobelias and Senecios are prominent features and so, too, are numerous small-leaved woody Composites, gray, willow-like Rosaceous shrubs, and a giant Heath with a dense, dark green billowy crown and a remarkable Rosaceous tree (*Brayera anthelmintica* Kunth), with large pinnate, deciduous leaves, huge termina panicles of greenish flowers, a short trunk and a wide-spreading flattened crown. This is the most alpine of Central African trees and is singularly like a Sumach in appearance. Herbs of course are plentiful and conspicuous and I noted many kinds of everlasting Composites, a Swe‡tia, a scarlet flowered Gladiolus and a Tritoma.

To me, however, the Juniper and the two Podocarps were the most interesting trees and are the most valuable timber trees in East Africa. The Juniper (*Juniperus procera* Hochst.) is the giant of the genus being sometimes 130 ft. tall and 30 ft. in girth of trunk. It grows in both dry and semi-dry regions and has an altitudinal range from 6500 ft. to 10,000 ft. where it is exceedingly abundant. Occasionally it forms pure forest but more usually it is mixed with the two Olives, with *Podocarpus gracilior* Pilger, *Nuxia congesta* R. Brown and other trees. Most of the Juniper is over-mature, the timber exceedingly faulty from ingrowing bark and fungus, and many of the trees are badly infested by Loranthus. The wood which varies from pale to rich cedar-brown, is very fragrant; it is not attacked by white ants, lasts well in the ground, and is excellent for panelling, shingles, window-sashes, etc., but unfortunately it is difficult to nail

since it cracks and splits readily. Though slightly harder than that of *Juniperus virginiana* L. the wood will do very well for pencils. This African Cedar is a tree with a massive bole, gray, fibrous bark, a wide-spreading crown and rather light green foliage. All in all it is the most valuable tree in the highland forests of Eastern Africa and it is a pity that so much of it is over-mature. *Podocarpus gracilior* is a singularly handsome tree abundant in the semi-dry forests though its distribution is often sharply defined. It is found at altitudes between 7000 and 9000 ft. This Podocarpus grows from 80 to 140 ft. tall by 12 to 25 ft. in girth of trunk and has a cylindrical bole clothed with scaly gray bark red-brown below, and a neat rounded crown composed of small branches. The wood is white, lustrous, free of resin and knots, but is somewhat brittle. Trees containing from 5000 to 7000 board feet are common and the maximum is about 10,000 board feet. Owing to the even shape of the bole it is possible to cut large boards and slabs—say from 4 to 5 ft. wide and from 50 to 60 ft. long. The other Podocarpus (*P. milanjiana* Rendle) has rather stronger wood, pale brownish in color but faulty from ingrowing bark. It favors the wetter forests at altitudes from 5000 ft. to 9000 ft. and is distinctly a shade-bearing tree. It is a tree of moderate size, seldom exceeding 80 ft. in height by 12 ft. in girth of trunk, and has gray, fibrous bark and a crown of unequal shape. In many respects it strongly resembles the Japanese *Podocarpus macrophyllus* D. Don but its foliage is much lighter green.

Of these two Podocarpus and the Juniper I have a fine series of photographs and plenty of herbarium material. Of most of the other trees mentioned I have photographs and dried material. The Juniper fruits readily but regenerates badly except in open country. I have a nice lot of seed of it which I hope to send you later. This tree will probably grow well in California and in other warm States."

Additions to the Library.— To the large number of books published in the 15th, 16th and 17th centuries, for which the Arboretum is indebted to Mrs. J. Montgomery Sears of Boston, can now be added a copy of HERBARIUS ZU TEUTSCH, or the German ORTUS SANITATIS (called also the smaller ORTUS). In the *Transactions of the Bibliographical society*, vol. vi, 1901, Dr. J. F. Payne writes of this edition as follows:

"This work which was the foundation of the numerous publications called HORTUS SANITATIS, was printed at Mainz early in 1485. The name of the printer is not given, but the double red shield of Peter Schöffer at the end assigns it to him. Appearing the year after the [Latin] HERBARIUS, issued by the same printer, it has been regarded by some authors as a second edition of that work, in German. But really, neither the text nor the illustrations of the two books are the same (though one part shows some resemblance), and as the newer work was completed on the 28th March, 1485, and must have taken a long time to prepare, it would

have been hardly possible in composing it to make much use of a book printed in the previous year. The wide circulation and the celebrity of the later Latin HORTUS and its successors, has tended to obscure the peculiar and unique position occupied by this fine folio, the publication of which forms an important land-mark in the history of botanical illustrations, and marks perhaps, the greatest single step ever made in that art. It was not only unsurpassed, but unequalled for nearly half a century."

From the preface it would appear that the originator of the work was a rich man who had travelled extensively in the East, partly for the purpose of studying botany and bringing home drawings of plants, and that under his direction the medical portion was compiled by a learned physician, probably Dr. Johann von Cube, who was town physician of Frankfurt at the end of the 15th century.

"On the second page of the preface occur these words: Und nennen diss buch zu Latin Ortus Sanitatis; uff teutsch ein gart der gesuntheit. ('Call this book in Latin Ortus Sanitatis; in German, a garden of health'.) The colophon, in red states "Disser Herbarius ist czu || mencz gedruct und geen || det uff dem xxviii dage des mercz. Anno M.cccclxxxv.

"It is to be noted that though the name Ortus Sanitatis is given in the preface, this was never used as the actual title of the German work, which is always called in the colophon (where one exists) Herbarius, while later editions (Augsburg 1488, 1493, 1496, 1499, etc.) have as a title on the first leaf the words HERBARIUS ZU TEUTSCH. Moreover, in two copies which I have seen with old binding, this is lettered on the outside Herbarius. It is therefore, more correctly called The German HERBARIUS, not ORTUS SANITATIS."

The copy in the possession of the Arboretum is in old binding, and is lettered "Lib Herb." Mrs. Sears has another copy of this book, in which the plates have been colored, apparently at a much later date, and the only other copy known to be in this country is in the Surgeon-General's Library at Washington.

In the Arboretum Library there are now in addition to Mrs. Sear's recent gift, copies of the following editions of the ORTUS SANITATIS:

Mainz, Meydenbach. 1491. *Hain* 8944.
[Strassburg, Prüss. c. 1497.] *Hain* 8941.
[Strassburg, Prüss. c. 1496.] *Hain* 8942.
[*Colophon:* —] Venetiis, Benalius et Cereto de Tridino. 1511.
[Strassburg, Beck.] 1517.

The Arboretum has recently obtained in London a copy of the work entitled:

Collection de cent Espèces ou Variétiés du genre Camellia peintes d'après nature, soigneusement lithographiees et coloriees par MLLE. G. FONTAINE, Bruxelles, Chez A. Mertens, Libraire Éditeur. 1845.

The well executed life-sized colored plates are accompanied by description and historical text which may have been prepared by Mlle. Fontaine as it is not accompanied by an author's name.

This appears to be a rare book. It is not mentioned by Pritzel, and is not found in the catalogues of the libraries of the British Museum (Nat. Hist. Dept.), of the Royal Gardens of Kew, and of the Department of Agriculture of the United States; it is not mentioned in the Bradley Bibliography.

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NOTES ON AMERICAN WILLOWS. XII

CAMILLO SCHNEIDER

a. SYSTEMATIC ENUMERATION OF THE SECTIONS, SPECIES, VARIETIES AND FORMS OF AMERICAN WILLOWS

IN a note "Ueber die systematische Gliederung der Gattung Salix" in Oest. Bot. Zeitschr. (1915) 273, I pointed out how difficult it is to elaborate a systematic arrangement of this genus representing the true relationship of the different sections. I do not agree with the arrangement made by Andersson (1867 and 1868) nor with the new grouping proposed by Von Seemen (1903) for reasons given in my note referred to above; and having studied, too, the Willows of Eastern Asia (see in Sargent, Pl. Wilson, III. 40–179 [1916]) I am convinced that some of the characters upon which Andersson and Von Seemen based their arrangements cannot be regarded as of great taxonomic value.

The real relationship between the different sections enumerated below cannot be shown clearly in a linear sequence. The first four sections include the species with more than three stamens and may be considered as forming a rather natural group known as Pleiandrae or Pleonandrae, but the sect. Nigrae does not seem to be too closely related to the others. Sections V to XXIII comprise the Willows with two stamens or with only one as it is the case with the last section Sitchenses. The occurrence of only one stamen in most of the flowers is also to be observed in *Salix Uva-ursi* which has now been placed by me in Sect. Herbaceae.

Besides the number of three or more stamens the first four groups have in the pale deciduous flower-bracts of both the male and female flowers another peculiar character in common. The same kind of bracts are found in Sect. V. Longifoliae, a group of otherwise very different species which occupies an isolated position among the American Willows.

Sect. VI to XXIII are arranged as far as possible according to the impression I got of their relationship by comparing all their taxonomic characters, I am not yet in a position to propose a good key clearly showing how to distinguish all those sections. As I have already explained in note VIII (Jour. Arnold Arb. I. 229), I thought it best not to unite species of apparently no close affinity in the same group but to propose

new sections for those species which show good characters. I can only repeat what I said in the introduction to note IX (l. c. II. 1), that I desire to induce as many students as possible to take a keen interest in the study of American Willows, and to point out the defects of our present knowledge in regard to them.

In the following enumeration I shall add a few corrections and new observations. I shall also include the full synonymy of all these species and forms dealt with by me in the Botanical Gazette, without repeating here the exact quotations indicating only the place where they are found.[1]

Sect. I. NIGRAE Loudon.—See Schneider in Bot. Gaz. LXV. 5 and in this Jour. I. 5.

1. **S. Humboldtiana** Willdenow.—*S. magellanica* Poiret.—*S. falcata* Kunth.—*S. Humboldtiana*,** *S. falcata* Andersson.—*S. Humboldtiana falcata* Andersson.—*S. chilensis* Morong & Britton, not Molina.—See Schneider in Bot. Gaz. LXV. 6, and in this Jour. I. 5.

1a. **S. Humboldtiana** f. **fastigiata** André in Rev. Hort. LXVIII. 177, f. 58–60 (1896).

1b. **S. Humboldtiana** var. **stipulacea** Schneider.—*S. Houstoniana* Pursh, pro parte.—*S. stipulacea* Martens & Galeotti.—*S. oxyphylla* Kunth.—*S. Humboldtiana* ***S. oxyphylla* Andersson, pro parte.—*S. Humboldtiana* γ *oxyphylla* Andersson, pro parte.—*S. Humboldtiana* Martens & Galeotti.—See Schneider in Bot. Gaz. LXV. 7, and in this Jour. I. 5.

1c. **S. Humboldtiana** var. **Martiana** Andersson.—*S. Martiana* Leybold.—*S. Humboldtiana* * *S. Martiana* Andersson.—See Schneider in Bot. Gaz. LXV. 8, and in this Jour. I. 5.

2. **S. nigra** Marshall.—See Schneider in this Jour. I. 5.—To the synonyms may be added with ? *S. dubia* Trautvetter in Mém. Sav. Étr. Acad. St.-Pétersb. III. 626 (Salict.) (1837). This is nothing but a new name for *S. ambigua* Pursh on account of the older name *S. ambigua* of Ehrhart. Pursh's name had already been changed by Sprengel.

2b. **S. nigra** var. **altissima** Sargent.—See Schneider in this Jour. I.

2c. **S. nigra** var. **Lindheimerii** Schneider. *S. Humboldtiana* γ *oxyphylla* Andersson, pro parte.—*S. nigra* Mackensen.—*S. Wrightii* Sargent, pro parte.—*S. Humboldtiana* Blankinship.—See Schneider in Bot. Gaz. LXV. 9 and in this Jour. I. 8.

3. **S. Gooddingii** Ball.—*S. nigra* Bebb, pro parte. *S. nigra* var. *vallicola* Dudley. *S. vallicola* Britton.—*S. Wrightii* Wooton & Standley, pro parte.—See Schneider in Bot. Gaz. LXV. 12, and in this Jour. I. 9. Ball in Bot. Gaz. LXXII, 227, fig. 2–4 (1921).

Sect. II. TRIANDRAE Dumortier.—Sect. *Amygdalinae* Koch, pro parte.—See Schneider in Bot. Gaz. LXV 13, and in this Jour. I. 9.

[1] After we had received from Mr. Schneider part XII of his Notes on American Willows two papers on American Willows by Mr. Ball have appeared in The Botanical Gazette; the new names published there have been inserted in this enumeration to make it as far as possible a complete account of all American Willows known to the end of 1921.—ED.

4. **S. amygdaloides** Andersson.—See Schneider in this Jour. I. 9.—Ball in Bot. Gaz. LXXII. 236 (1921).

4a. **S. amygdaloides** f. **pilosiuscula** Schneider in this Jour. I. 11.

4b. **S. amygdaloides** var. **Wrightii** Schneider.—*S. Wrightii* Andersson.—*S. nigra* *** *S. Wrightii* Andersson.—*S. nigra β latifolia γ brevifolia testacea* Andersson.—*S. testacea* Andersson.—See Schneider in Bot. Gaz. LXV. 14, and in this Jour. I. 12.

Sect. III. PENTANDRAE Dumortier, subsect. LUCIDAE Schneider.—See Schneider in this Jour. I. 13.

5. **S. serissima** Fernald.—See Schneider, in this Jour. I. 13.—Ball in Bot. Gaz. LXXII. 220 (1921).

6. **S. lasiandra** Bentham.—See Schneider in this Jour. I. 15.—Ball in Bot. Gaz. LXXII. 222 (1921).[1]—*S. Hoffmanniana* Hooker & Arnott, Bot. Beechey's Voy. 159 (1833), non Smith.

6b. **S. lasiandra** var. **lancifolia** Bebb.—? *S.* (*pentandra*) *lucida angustifolia pilosa* Andersson.—*S. lancifolia* Andersson.—See Schneider in this Jour. I. 17.

6c. **S. lasiandra** var. **caudata** Sudworth.—See Schneider in this Jour. I. 19.[2]

7. **S. lucida** Muhlenberg.—See Schneider in this Jour. I. 20.—Ball in Bot. Gaz. LXXII. 220 (1921).

7a. **S. lucida** f. **angustifolia** Fernald.—See Schneider in this Jour. I. 22.

7b. **S. lucida** var. **intonsa** Fernald.—See Schneider in this Jour. I. 22.

Sect. IV. BONPLANDIANAE Schneider.—Sect. *Amygdalinae* Andersson, pro parte.—See Schneider in Bot. Gaz. LXV. 15 and in this Jour. I. 22.

8. **S. jaliscana** Jones.—See Schneider in Bot. Gaz. LXV. 16 and in this Jour. I. 22

9. **S. Bonplandiana** Kunth.—See Schneider in Bot. Gaz. LXV. 17, and in this Jour. I. 23.

9a. **S. Bonplandiana** forma incerta.—*S. Humboldtiana falcata* J. D. Smith.—See Schneider in Bot. Gaz. LXV. 19.

9b. **S. Bonplandiana** var. **pallida** Andersson.—*S. pallida* Kunth.—*S. Bonplandiana* * *S. pallida* Andersson.—See Schneider in Bot. Gaz. LXV 19 and in this Jour. I. 23.

9c. **S. Bonplandiana** var. **Toumeyi** Schneider.—*S. Bonplandiana* Bebb, pro parte.—*S. Toumeyi* Britton.—See Schneider in Bot. Gaz. LXV. 20, and in this Jour. I. 23.

10. **S. laevigata** Bebb.—See Schneider in this Jour. I. 23.

10a. **S. laevigata** f. **araquipa** Jepson.—See Schneider in this Jour. I.

[1] **S. lasiandra** var. **Abramsii** Ball in Bot. Gaz. LXXII. 224 (1921).—"It differs from the species chiefly in the smaller and narrower, less serrulate leaves and the nearly eglandular pedicels. It seems to be limited in its distribution to the Sierra Nevada of central eastern California, from Plumas County, south to Fresno County."—ED.

[2] **S. caudata** var. **parvifolia** Ball in Bot. Gaz. LXXII. 225, fig. 1 (1921).—"In the northern part of the range of *S. caudata* is found a form of lower stature and with shorter narrower leaves (fig. 1). It occurs rather commonly and appears to be the dominant form in the mountains of northwestern Montana and southern Alberta." Specimens are enumerated from Alberta, Montana, Wyoming, Idaho, Oregon, Utah.—ED.

24.—*S. laevigata* var. *araquipa* Ball in Bot. Gaz. LXXII. 234 (1921).

11. **S. longipes** Shuttleworth.—*S. occidentalis* Bosc.—*S. subvillosa* Elliott.—*S. longipes* var. *pubescens* Andersson.—*S. gongylocarpa* Shuttleworth.—*S. floridana* Chapman.—*S. Humboldtiana* Grisebach.—*S. nigra* ****S. longipes gongylocarpa* Andersson.—*S. nigra* γ *longipes* 2 *gongylocarpa* Andersson.—*S. Bonplandiana* Sauvalle.—*S. occidentalis* var. *longipes* Bebb.—*S. amphibia* Small.—See Schneider in Bot. Gaz. LXV. 21 and in this Jour. I. 23.—Ball in Bot. Gaz. LXXII. 235 (1921).

11b. **S. longipes** var. **venulosa** Schneider.—See Schneider in this Jour. I. 26.

11c. **S. longipes** var. **Wardii** Schneider.—See Schneider in this Jour. I, 27.

12. **S. Harbisonii** Schneider.—See Schneider in this Jour. I. 29.—It should be mentioned that there has been described a *S. caroliniana* by Michaux, Fl. Bor. Am. II. 226 (1803), from "Carolina et Georgia." He cites *S. pentandra* Walter as a synonym, and that species is the same as *S. nigra* Marshall. From the description it remains uncertain what form Michaux had in mind, and most of the authors have regarded his *caroliniana* as nothing but *nigra*. Nevertheless it might be identical with *S. Harbisonii* but unfortunately no type specimen seems to exist in Michaux's herbarium at Paris.

Sect. V. LONGIFOLIAE Andersson.—See Schneider in Bot. Gaz. LXV. 22; LXVII. 309.

13. **S. taxifolia** Kunth.—? *S. taxifolia* b. *lejocarpa* Andersson.—*S. taxifolia* α *sericocarpa* Andersson.—*S. taxifolia* α *sericocoma* Andersson.—See Schneider in Bot. Gaz. LXV. 23; LXVII. 316.

13b. **S. taxifolia** var. **microphylla** Schneider.—See Schneider in Bot. Gaz. LXV. 24; LXVII. 316.—*S. microphylla* Schlechtendal & Chamisso.—*S. taxifolia* Andersson, pro parte.

14. **S. sessilifolia** Nuttall.—*S. sessilifolia villosa* Andersson.—*S. macrostachya* Nuttall.—*S. macrostachya Cusickii* Rowlee.—*S. longifolia sessilifolia* Jones.—See Schneider in Bot. Gaz. LXVII. 316.

14b. **S. sessilifolia** var. **Hindsiana** Andersson.—*S. Hindsiana* Bentham.—*S. longifolia argyrophylla angustissima* Andersson.—*S. sessilifolia* Sargent, pro parte.—See Schneider in Bot. Gaz. LXVII. 318.

14c. **S. sessilifolia** var. **leucodendroides** Schneider.—*S. macrostachya leucodendroides* Rowlee.—*S. integrifolia leucodendroides* Rowlee.—*S. exigua virens* Rowlee, pro parte.—*S. argophylla* Rowlee, pro parte.—*S. sessilifolia* Britton & Shafer, pro parte.—*S. macrostachya* Abrams, pro parte.—See Schneider in Bot. Gaz. LXVII. 319.[1]

[1] With regard to the footnote given (l. c.) on p. 322 I received the following statement from Mr. Johnston in a letter dated Oct. 28, 1919: "I see in your recent synopsis of the willows of the section Longifoliae (p. 322) that I apparently gave some confusing information. As, no doubt, you suspected the data given in the footnote should refer to my collection No. 1241 from Cucamonga Canyon rather than to my No. 1243 from Red Hill as it is given. Concerning the Red Hill collection (No. 1243) the following data may be given:

15. **S. fluviatilis** Nuttall.—See Schneider in Bot. Gaz. LXVII. 322.

16. **S. Parishiana** Rowlee.—*S. sessilifolia* Jepson, pro parte.—*S. longifolia* var. *argyrophylla* Jepson, pro parte.—*S. argophylla* Abrams, pro parte.—See Schneider in Bot. Gaz. LXVII, 323.

17. **S. argophylla** Nuttall.—*S. macrostachya* Piper.—*S. sessilifolia* Britton & Shafer, pro parte.—See Schneider in Bot. Gaz. LXVII. 325.

18. **S. exigua** Nuttall.—*S. longifolia* var. *β* Hooker, pro parte.—*S. longifolia* Watson, pro parte.—*S. longifolia* var. *exigua* Bebb, pro parte.—*S. longifolia* var. *argyrophylla* Macoun, pro parte.—*S. fluviatilis* var. *exigua* Sargent, pro parte.—*S. longifolia* var. *argophylla* Jones, pro parte.—*S. argophylla* J.K.Henry.—See Schneider in Bot. Gaz. LXV. 25; LXVII. 328.

18b. **S. exigua** var. **nevadensis** Schneider.—*S. nevadensis* Watson.—See Schneider in Bot. Gaz. LXVII. 331.

18c. **S. exigua** var. **stenophylla** Schneider.—*S. Hindsiana tenuifolia* Andersson, pro parte.—*S. longifolia opaca* Anderson, pro parte.—*S. longifolia argyrophylla* Andersson, pro parte.—*S. longifolia* Rothrock.—*S. longifolia exigua* Bebb, pro parte.—*S. fluviatilis exigua* Sargent, pro parte.—*S. fluviatilis argyrophylla* Sudworth, pro parte.—*S. longifolia argophylla* Jones, pro parte.—*S. longifolia interior* Jones, pro parte.—See Schneider in Bot. Gaz. LXV. 25; LXVII. 333.

18d. **S. exigua** var. **luteosericea** Schneider.—*S. luteosericea* Rydberg.—See Schneider in Bot. Gaz. LXVII. 334.

18e. S. exigua var. **tenerrima** Schneider.—*S. longifolia tenerrima* Henderson.—*S. tenerrima* Heller.—*S. fluviatilis tenerrima* Howell.—*S. linearifolia* Rydberg, pro parte.—See Schneider in Bot. Gaz. LXVII. 335.

19. **S. melanopsis** Nuttall.—*S. longifolia* Bebb, pro parte.—*S. fluviatilis* Howell, pro parte.—See Schneider in Bot. Gaz. LXVII 336.

19b. **S. melanopsis** var. **Bolanderiana** Schneider.—*S. longifolia* Bebb, pro parte.—*S. Bolanderiana* Rowlee.—*S. exigua virens* Rowlee, pro parte.—*S. argophylla* Rowlee, pro parte.—*S. fluviatilis* Eastwood, pro parte.—See Schneider in Bot. Gaz. LXVII. 338.

20. **S. longifolia** Muhlenberg.—*S. fluviatilis* Sargent, pro parte.—*S. interior* Rowlee.—*S. longifolia integerrima, multidenticulata* et *paucidenticulata* Kuntze.—See Schneider in Bot. Gaz. LXVII. 340.

20a. **S. longifolia** f. **Wheeleri** Schneider.—*S. interior* var. *Wheeleri* Rowlee.—*S. Wheeleri* Rydberg.—*S. longifolia argyrophylla* Auct., pro parte.—*S. fluviatilis* var. *argyrophylla* Auct., pro parte.—See Schneider in Bot. Gaz. LXVII. 342.

"Red Hill is a peculiar small mesa that projects up out of the gravelly and rocky 'wash' or diluvial flood plain of Cucamonga Canyon. It receives surface water from Cucamonga Canyon only during floods and is a good 2½ miles below (south of) its mouth up which about a mile is found the nearest colony of *S. sessilifolia* that I know, this being the one described for my No. 1241. Scattering colonies are found in the lower canyons of the San Antonio Mts. to the north, but southward perhaps the nearest station is along the Santa Ana River over ten miles away. At Red Hill there is only a single, small dense clump of this willow which is situated at the mouth of a small 'draw' some distance up and away from the small main stream that never lasts through the summer. The colony is circular in outline being hardly 25 ft. in diameter. The associated willows are *Salix lasiolepis* and *S. laevigata*. If this Longifoliae-material

20b. **S. longifolia** var. **pedicellata** Andersson.—*S. rubra* Richardson.—*S. longifolia* ? Torrey.—*S. fluviatilis* Sargent, pro parte.—*S. interior* Rowlee, pro parte.—*S. linearifolia* Rydberg, pro parte.—*S. longifolia interior* Jones, pro parte.—See Schneider in Bot. Gaz. LXVII. 344.

20c. **S. longifolia** var. **angustissima** Andersson.—*S. longifolia* *** *opaca* Andersson, pro parte.—*S. longifolia argyrophylla* Andersson, pro parte.—*S. Thurberi* Rowlee.—See Schneider in Bot. Gaz. LXV. 26.

An incertain form of this section is *S. longifolia* var. *sericans* Nees v. Esenbeck mentioned by me in Bot. Gaz. LXVII. 346.

Sect. VI. RETICULATAE Fries.—Sect. *Chamaetia* Dumortier in Bijdr. Nat. Wet. I. 56 (Verh. Gesl. Wilg. 15) (1825).—Sect. *Chamitea* A. et E.-G. Camus, Class. Saul. Eur. I. 129 (1904).—See Schneider in Sargent, Pl. Wilson III. 144 in Bot. Gaz. LXVII. 43.

21. **S. reticulata** Linnaeus.—*S. reticulata glabra* Trautvetter.—*S. reticulata normalis* Andersson.—*S. reticulata typica glabra* Andersson.—*S. orbicularis* Andersson, pro parte.—*Chamitea reticulata* Kerner.—See Schneider in Sargent, Pl. Wilson III. 144 and in Bot. Gaz. LXVII. 44.

21a. **S. reticulata** f. **subrotunda** Seringe.—*S. reticulata* Hoffmann.—*S. orbicularis* Andersson, pro parte,—See Schneider in Bot. Gaz. LXVII. 45.

22. **S. vestita** Pursh.—*S. reticulata vestita* Andersson pro parte.—*S. vestita humilior* Andersson.—See Schneider in Bot. Gaz. LXVII. 45.

22b. **S. vestita** var. **erecta** Andersson.—*S. Fernaldii* Blankinship.—See Schneider in Bot. Gaz. LXVII. 46.

23. **S. leiolepis** Fernald.—See Schneider in Bot. Gaz. LXVII. 46.

24. **S. nivalis** Hooker.—? *S. vestita* β. *nana* Hooker, Fl. Bor. Am. II. 152 (1839).—*S. reticulata nana* Andersson, pro parte.—*S. reticulata nivalis* Andersson.—See Schneider in Bot. Gaz. LXVII. 47.

24b. **S. nivalis** var. **saximontana** Schneider.—*S. reticulata* Bebb.—*S. saximontana* Rydberg.—*S. aemulans* Von Seemen.—See Schneider in Bot. Gaz. LXVII. 47.

To this section may possibly belong the following two very obscure species of which Andersson gave a very insufficient description and of which I have not yet seen the type material: *S. obcordata* Andersson and *S. venusta* Andersson, see Schneider in Bot. Gaz. LXVII. 64.

Sect. VII. HERBACEAE Borrer.—Sect. *Chamaetia* Dumortier, pro parte.—Sect. *Retusae* Kerner.—Sect. *Myrsinites* Schneider, pro parte.—See Schneider in Bot. Gaz. LXVII. 48.

25. **S. polaris** Wahlenberg.—?*S. herbacea* var. *polaris* Kurtz.—See Schneider in Bot. Gaz. LXVII. 49.

25a. **S. polaris** f. **subarctica** Lundström.—See Schneider in Bot. Gaz. LXVII. 49. ? *S. prostrata* Muhlenberg, Cat. Pl. Am. Sept. 91 (1813), nom. nud.

26. **S. Uva-ursi** Pursh.—*S. Cutleri* Tuckerman.—*S. retusa* Oakes ex

under this number is of hybrid origin it must have been carried miles in the seed state before being deposited. It seems to me, though, more likely that it is a descendant of the canyon plants."

Tuckerman in Am. Jour. Sci. ser. 1, XLV. 36 (1843), pro synon.—*S. Cutleri major* et *minor* Andersson.—*S. Cutleri* var. *labradorica* Andersson.—*S. Myrsinites* var. *parvifolia* Lange.—*S. ivigtutiana* Lundström.—See Schneider in Bot. Gaz. LXVII. 50.

26a. **S. Uva-ursi** f. **lasiophylla** Fernald in Rhodora, XVIII. 52 (1916).—I overlooked this form when I dealt with this species in 1919.

I do not enumerate *S. Peasei* Fernald as a species because it is, in my opinion, to be regarded as a hybrid between the foregoing and the following species. See my statements in Bot. Gaz. LXVII. 51.

27. **S. herbacea** Linnaeus.—See Schneider in Bot. Gaz. LXVII. 52.

28. **S. rotundifolia** Trautvetter.—*S. polaris leiocarpa* Chamisso.—*S. retusa rotundifolia* Treviranus.—*S. leiocarpa* Coville.—See Schneider in Bot. Gaz. LXVII. 53.

28a. **S. rotundifolia** f. **pilosiuscula** Schneider.—See Schneider in Bot. Gaz. LXVII. 52.

29. **S. phlebophylla** Anderson.—*S. anglorum* Chamisso, pro parte.—*S. buxifolia* Treviranus.—*S. retusa* Hooker & Arnott.—*S. arctica minor* Ledebour.—*S.* (*retusa*) *phlebophylla* Andersson, includ. f. *major*, f. *minor* et f. *media*, pro parte.—*S. arctica buxifolia* Ledebour.—*S. rotundifolia retusa* Turner.—*S. palaeoneura* Rydberg.—See Schneider in Bot. Gaz. LXVII. 53.

30. **S. Dodgeana** Rydberg.—See Schneider in Bot. Gaz. LXVII. 54.

31. **S. cascadensis** Cockerell.—*S. tenera* Andersson.—*S. phlebophylla* Watson.—*S. arctica petraea* Bebb, pro parte.—*S. Brownii petraea* Bebb, pro parte,—*S. Brownii tenera* Jones.—See Schneider in Bot. Gaz. LXVII. 55.

Sect. VIII. OVALIFOLIAE Rydberg.—Sect. *Arcticae* Rydberg, pro parte.—Sect. *Diplodictyae* Schneider.—See Schneider in Bot. Gaz. LXVII. 56.

32. **S. petrophila** Rydberg.—*S. arctica petraea* Andersson, pro parte.—*S. arctica subalpestris* Andersson.—See Schneider in Bot. Gaz. LXVI. 135.

32a. **S. petrophila** var. **caespitosa** Schneider.—*S. arctica petraea* Bebb, pro parte.—*S. caespitosa* Kennedy.—See Schneider in Bot. Gaz. LXVI. 136.

33. **S. anglorum** Chamisso.—*S. arctica* R. Brown.—*S. arctica Brownei* Andersson, pro parte.—*S. Brownei* Lundström.—*S. Brownii* Bebb.—*S. groenlandica* Rydberg, pro parte.—See Schneider in Bot. Gaz. LXVI, 126.

33b. **S. anglorum** var. **kophophylla** Schneider.—See Schneider in Bot. Gaz. LXVI. 130.

33c. **S. anglorum** var. **araioclada** Schneider.—See Schneider in Bot. Gaz. LXVI. 133.

33d. **S. anglorum** var. **antiplasta** Schneider.—See Schneider in Bot. Gaz. LXVI, 134.

34. **S. arctica** Pallas.—*S. crassijulis* Treviranus.—*S. Pallasii crassijulis* Andersson, incl. f. *oblongata* et *f. grandifolia*.—*S. arctica Brownei*

oblonga Andersson.—*S. arctica Pallasii* Kurtz in Bot. Jahrb. XIX. 74 (1894).—*S. arctica* f. *longijulis* Lundström apud Kjellman in Nordenskiöld, Vega Exp. Vet. Jakttagel. II. 51 (Fanerog. Vest-Eskimaernas Land) (1883).—See Schneider in Bot. Gaz. LXVI. 118.

34a. **S. arctica** f. **diplodictya** Schneider, trans. nov.*—*S. diplodictya* Trautvetter.—*S. Pallasii* var. *diplodictya* Andersson, pro parte.—*S. arctica* var. *Pallasii* f. *diplodictya* Kurtz in Bot. Jahrb. XIX. 474 (1894).—See Schneider in Bot. Gaz. LXVI. 56.

34b. **S. arctica** var. **glabrata** Trautvetter. See Schneider in Bot. Gaz. LXVI. 122.

34c. **S. arctica** var. **subcordata** Schneider.—*S. cordifolia* Hooker, pro parte.—*S. subcordata* Andersson.—*S. obovata glabra* Barratt.—See Schneider in Bot. Gaz. LXVI. 123.

Salix arctica var. *obcordata* Rydberg (*S. Pallasii* α *crassijulis* 3. *obcordata* Andersson.—*S. Pallasii* var. *obcordata* Turner) see Schneider in Bot. Gaz. LXVI. 122.

Salix arctica var. *subphylicifolia*, var. *subreticulata* and var. *subpolaris* Andersson see Schneider in Bot. Gaz. LXVI. 120.

35. **S. ovalifolia** Trautvetter.—*S. myrtilloides* f. 4. Chamisso.—*S. unalaschkensis* Chamisso ex Andersson.—*S. rotundata* Rydberg.—*S. cyclophylla* Rydberg.—See Schneider in Bot. Gaz. LXVI. 138.—To the typical *S. ovalifolia* probably also belongs *S. myrtilloides* f. 3. Chamisso in Linnaea, V. 539 (1831) which Andersson first described as *S. ovalifolia major* in Öfv. Svensk. Vet.-Akad. Forh. 131 (1858); in Proc. Am. Acad. IV. 72 (Sal. Bor.-Am. 26) (1858); in Walpers. Ann. Bot. 755 (1858), and later as *S. fuscescens* β ? *minor* in De Candolle, Prodr. XVI^2. 230 (1868). According to Chamisso it came "e sinu Schischmareffii" (Shishmaref Inlet) in Alaska.

35b. **S. ovalifolia** var. **pubescens** Andersson.—See Schneider, in Bot. Gaz. LXVI. 138.

35c. **S. ovalifolia** var. **subarctica** Lundström.—*S. diplodictya* Rydberg.—See Schneider in Bot. Gaz. LXVI. 139.

35d. **S. ovalifolia** var. **camdensis** Schneider.—See Schneider in Bot. Gaz. LXVI. 139.

36. **S. stolonifera** Coville.—*S. unalaschensis* Rydberg.—See Schneider in Bot. Gaz. LXVI. 137; LXVII. 57.

36a. **S. stolonifera** f. **subpilosa** Schneider.—See Schneider in Bot. Gaz. LXVI. 137.

37. **S. arctophila** Cockerell.—*S. arctica* Liebmann.—*S. arctica* γ *Groenlandica* Andersson, incl. f. *hebecarpa, latifolia, angustifolia et macrocarpa* et ? *pusilla*.—*S. groenlandica* Lundström.—*S. groenlandica hebecarpa, latifolia* et *angustifolia* et ? *pusilla* et ? *minutifolia* Lange.—*S. anglorum* Rydberg, pro parte.—See Schneider in Bot. Gaz. LXVI. 140 (sub *S. groenlandica*); LXVII. 57.

* For explanation of the terms "trans. nov." (translatio nova, new transfer) and "stat. nov." (status novus, new status) see Bailey, Gentes Herb. 1. 8 (1920).

37b. **S. arctophila** var. **lejocarpa** Schneider.—*S. arctica groenlandica lejocarpa* Andersson.—*S. groenlandica lejocarpa* Lange.—See Schneider in Bot. Gaz. LXVI. 141; LXVII. 57.

38. **S. hudsonensis** Schneider. *S. Macounii* Rydberg, pro parte.—?*S. fullertonensis* × *S. groenlandica* Schneider.—See Schneider in Bot. Gaz. LXVI. 342; LXVII. 57.

To this section apparently also belongs *S. glacialis* Andersson (*S. Uva-ursi* Seemann, pro parte) which seems to be closely related to *S. ovalifolia* but as long as its male flowers are unknown its taxonomic value and its true affinity remain doubtful. See Schneider in Bot. Gaz. LXVII. 63.

Sect. IX. GLAUCAE Fries.—Sect. *Arcticae* Rydberg, pro parte.—See Schneider, in Bot. Gaz. LXVI. 318; LXVII. 58.

39. **S. fullertonensis** Schneider in Bot. Gaz. LXVI. 340.

40. **S. chlorolepis** Fernald.—See Schneider in Bot. Gaz. LXVI. 338; LXVII. 60.

40b. **S. chlorolepis** var. **antimima** Schneider. *S. desertorum* Fernald.—See Schneider in Bot. Gaz. LXVI. 339.

41. **S. brachycarpa** Nuttall.—*S. desertorum* Andersson, incl. var. *stricta* et var. *fruticulosa*, sed prob. excl. var. *elata*.—*S. stricta* Rydberg.—? *S. desertorum* var. *acutifolia* Barratt, Herb.—See Schneider in Bot. Gaz. LXVI. 336.

41b. **S. brachycarpa** var. **glabellicarpa** Schneider in Bot. Gaz. LXVI. 338.

42. **S. niphoclada** Rydberg.—See Schneider in Bot. Gaz. LXVI. 339; LXVII. 50.

43. **S. desertorum** Richardson.—*S. glauca* * *S. desertorum* Andersson.—See Schneider in Bot. Gaz. LXVI. 331.

44. **S. pseudolapponum** Von Seemen.—*S. glauca rillosa* Andersson, pro parte. *S. glaucops* Rydberg, pro parte. —*S. desertorum* Ball, pro parte.—*S. Wolfii* var. *pseudolapponum* Jones, pro parte.—See Schneider in Bot. Gaz. LXVI. 334.

45. **S. Maccalliana** Rowlee.—See Schneider in this Jour. II. 89.

46. **S. glauca** Linnaeus.—See Schneider in Bot. Gaz. LXVI. 319.

46a. **S. glauca** var. **acutifolia** Schneider.—*S. glauca* Richardson.—*S. rillosa* Barratt.—*S. rillosa* var. *acutifolia* Hooker.—*S. glauca* var. *rillosa* Andersson, pro parte.—*S. glaucops* Andersson and var. α *villosa* Andersson, pro parte.—? *S. glauca subarctica* Kjellman.—*S. Seemannii* Rydberg.—*S. glauca* var. *Seemanii* Ostenfeld.—See Schneider in Bot. Gaz. LXVI. 327; LXVII. 60.—To the variety probably belongs also as a synonym *S. Stuartiana* Hooker. Fl. Bor.-Am. II: 151 (1839), incl. var. β, non Smith. It had been collected by Beechey on Kotzebue's Sound and var. β by Richardson on the Mackenzie River.

46b. **S. glauca** var. **acutifolia** f. **poliophylla** Schneider in Bot. Gaz. LXVII. 61.

46c. **S. glauca** var. **glabrescens** Schneider.—*S. glaucops* var. *glabrescens*

Andersson.—*S. Austinae* Rydberg, pro parte.—See Schneider in Bot. Gaz. LXVI. 329.

46d. **S. glauca** var. **ovalifolia** Lange.—*S. glauca sericea ovalifolia* Andersson.—See Schneider in Bot. Gaz. LXVI. 351.—Lange also enumerated the following varieties: var. *sericea*, var. *appendiculata*, var. *angustifolia* (? *S. glauca* α *sericea* var. *angustifolia* Anderss.) and var. *alpina* from Greenland of which I have spoken, l. c. These forms need a very close investigation, and I strongly believe, as I have already said, in Bot. Gaz. LXVI. 353, that the true *S. glauca* is entirely absent from eastern North America, and that it is here represented by *S. cordifolia* and its varieties, and by *S. anamesa*.

47. **S. cordifolia** Pursh.—*S. callicarpaea* Trautvetter.—*S. planifolia* Hooker.—*S. alpestris c. americana* Andersson.—*S. arctica* β *Brownei* 3° *fumosa* Andersson.—*S. glauca* Rydberg, pro parte.—*S. Waghornei* Rydberg, pro parte.—*S. labradorica* Rydberg, pro parte.—See Schneider in Bot. Gaz. LXVI. 343.

47a. **S. cordifolia** f. **hypoprionota** Schneider in Bot. Gaz. LXVI. 346.

47b. **S. cordifolia** f. **atra** Schneider.—*S. atra* Rydberg.—See Schneider in Bot. Gaz. LXVI. 346.[1]

47c. **S. cordifolia** var. **Macounii** Schneider.—*S. Macounii* Rydberg.—*S. Rydbergii* Heller.—*S. vacciniformis* Rydberg.—See Schneider in Bot. Gaz. LXVI. 347.

48. **S. anamesa** Schneider.—*S. glauca* Lange, pro parte.—See Schneider in Bot. Gaz. LXVI. 348.

49. **S. lingulata** Andersson.—See Schneider in Bot. Gaz. LXVI. 353.

Gandoger, (Fl. Eur. XXI. 157–158 [1890]), has proposed as what should be called subspecies of *S. glauca* the following names for forms from Greenland: *S. eskimorum*, *S. groenlandica*, *S. platycarpa*, and *S. Vahlii*. His descriptions are very unsatisfactory, and these forms cannot be regarded as species in our sense. I have not yet seen the types but I suppose that these specimens only represent forms of *S. anamesa*.

Sect. X. WOLFIANAE, sect. nov.—Sect. *Commutatae* Ball apud Coulter & Nelson, New Man. Rocky Mts. Bot. 134 (1909), pro parte.—Frutices ut videtur satis parvi, erecti, ramis divaricatis. Folia matura firma sed tenuia, lanceolata, oblanceolata, rhomboideo-oblanceolata and elliptico-lanceolata, saepissime integerrima, utrinque concoloria et subaequaliter stomatifera, plusminusve argenteo-sericea. Amenta plus-

[1] This form seems to bear some affinity to *S. macrocarpa* Andersson in Öfv. Svensk. Vet.-Akad. Förh. XV. 124 (1858), non Nuttall; in Proc. Am. Ac. IV. 64 (Sal. Bor.-Am. 19) (1858 : in Svensk. Vet.-Akad. Handl. VI. t. 7, f. 76 (mala) (1867); in DeCandolle, Prodr. XVI.[2] 245 (1868), which is based on a specimen collected by Burke, Hudson Bay, and has nothing to do with *S. macrocarpa* Nuttall (= *S. Geyeriana* And.). I have seen a photograph and fragments of the type (Herb. K.). It bears rather old fruiting aments, and agrees well with Andersson's description. The pedicels are almost as long as the bracts and densely hairy while the ovaries (fruits) are glabrous or nearly so. A specimen collected by J. M. Macoun, at Churchill, on July 30, 1910 (No. 7915♀, fr.; A., Cor., O.) has rather similar but entirely pubescent fruits. These forms from the Hudson Bay Region need a careful study, and I am at present unable to interpret Andersson's form correctly.

minusve coetanea, brevissime pedunculata, parva, ellipsoidea, densiflora; flores masculi diandri, filamentis glabris liberis, antheris flavis, glandulis duobus, ventrali ovoideo-rectangulari, dorsali minore filiformi saepe minima, bracteis atrofuscis; feminei fructusque subsessiles, glabri; styli breves vix ad 1 mm. longi, stigmatibus minimis bifidis; glandula 1, ventralis, ut in masculis; fructus e basi ovoideo-rhomboidali conico-subrostrati 4–5.5 mm. longi.

As I have already explained in this Jour. I. 229, *S. Wolfii* represents a rather peculiar type among American Willows, especially on account of the presence of a dorsal gland in the male flowers. I, therefore, thought it best to propose a new section for it.

50. **S. Wolfii** Bebb.—See Schneider, l. c. in this Jour. I. 329.

50b. **S. Wolfii** var. **idahoensis** Ball.—See Schneider in this Jour. I. 231.

Sect. XI. Mexicanae Schneider, sect. nov.—Frutices ut videtur mediocres, erecti, ramulis satis elongatis strictis divaricatis. Folia matura firma, satis crasse chartacea, elongato-lanceolata ad anguste-elliptico-lanceolata, glanduloso-denticulata, pubescentia vel glabra. Petioli breves, 2–8 mm. longi. Amenta autumno in axillis foliorum adultorum apparentia, sessilia, breviter cylindrica, densiflora. Bracteae brunnescentes. Flores masculi diandri, filamentis glabris liberis, antheris flavis, glandulis duobus ventrali-ovoideo-rectangulari, dorsali simili minore; feminei ovoideo-conici, glabri, pedicello distincto glabro dimidio ovarii sublongiore suffulti; styli distincti, sed breves stigmatibus oblongis bifidis subaequilongi; glandula 1, ventralis ut in masculis; fructus ovoideo-oblongi, subrostrati, circ. 4 mm. longi pedicello 1.5–2 mm. longo excluso.—The two species of this new section may have their closest affinity with those of Sect. *Cordatae* but they possess a dorsal gland in the male flowers and represent a rather well marked group among the American Willows. As I have already pointed out in Bot. Gaz. LXV. 29 (1918) the late time of flowering cannot be regarded as a valuable taxonomic character because there are spring flowering forms of *S. mexicana*, and of *S. lasiolepis* there are known forms of southern California flowering in the fall.

51. **S. Hartwegii** Bentham.—*S. humilis* * *S. Hartwegii* Andersson.—*S. humilis* ♂ ? *Hartwegii* Andersson.—See Schneider in Bot. Gaz. LXV. 28.

52. **S. mexicana** Von Seemen.—See Schneider in Bot. Gaz. LXV. 29.—In the Herbarium of the Botanical Museum at Berlin-Dahlem I have seen all the specimens mentioned by Von Seemen. The type was collected by Berlandier at Zacualtipan, State of Hidalgo, and is No. 307. It consists of a sterile shoot only. The specimen is marked by Andersson "Sal. amygdaloides vel Sal. daphnoides?." The male syntype is a specimen collected by C. Ehrenberg (No. 267) at "S. Pietro & S. Paolo," the fruiting syntype is Uhde's No. 329, "Mexico 1846" without an exact locality.

53. **S. Schaffnerii** Schneider in Bot. Gaz. LXV. 30 (1918).—The male plant being unknown, the systematic position of this species remains doubtful.

Sect. XII. CORDATAE Barratt.—See Schneider in this Jour. II. 185.

54. **S. irrorata** Andersson.—See Schneider in this Jour. II. 186.

55. **S. lasiolepis** Bentham.—See Schneider in this Jour. II. 187.

55b. **S. lasiolepis** var. **Bigelowii** Bebb.—See Schneider in this Jour. II. 188.

55c. **S. lasiolepis** var. **Bakeri** Ball in Bot. Gaz. LXXI. 436 (1921).—See also Schneider in this Jour. II. 188 (1922).

56. **S. ligulifolia** Ball.—See Schneider in this Jour. II. 188.

57. **S. cordata** Muhlenberg.—See Schneider in this Jour. II. 189.

57b. **S. cordata** var. **angustata** Andersson.—See Schneider in this Jour. II. 190.

58. **S. missouriensis** Bebb.—*S. cordata* var. *missouriensis* Mackenzie & Bush in Mackenzie, Man. Fl. Jackson Co., Mo. 69 (1902).—See Schneider in this Jour. II. 190.

59. **S. mackenzieana** Barratt.—See Schneider in this Jour. II. 190.

59b. **S. mackenzieana** var. **macrogemma** Ball.—See Schneider in this Jour. II. 191.

60. **S. lutea** Nuttall.—See Schneider in this Jour. II. 191.[1]

60a. **S. farrae** Ball apud Standly in Contr. U. S. Nat. Herb. XXII. 321 (1921).—This new species represents a Willow from the "Rocky Mts. of southern Alta. and B. C. and northern Mont." "Frequent on the eastern slope at middle altitudes or about timber line; in bogs or wet meadows." It seems to be most closely allied to *S. lutea* the variations or which we are far from knowing sufficiently. I suppose that Ball has already published a good description of his new species because his statements in Standley's Flora are very incomplete. I do not know what Willow he really has in mind.[2]

61. **S. monochroma** Ball in Bot. Gaz. LXXI. 431, fig.1 (1921). —See also Schneider in this Jour. II. 192 (1922).

62. **S. myrtillifolia** Andersson.—See Schneider in this Jour. II. 193.

[1] **S. lutea** var. **famelica** Ball in Bot. Gaz. LXXI. 426 (1921).—"This variety differs from *S. lutea* chiefly in the very small and more strongly nerved leaves." Specimens are enumerated from South and North Dakota and Montana.

S. lutea var. **ligulifolia** Ball in Bot. Gaz. LXXI. 428 (1921).—*S. cordata* Bebb, Willows Calif. 85 (1879), pro parte; in Coulter Man. Bot. Rocky Mt. Reg. 335 (1885), pro parte.—*S. cordata* **Watsonii** Ball in Coulter & Nelson, New Man. Rocky Mt. Bot. 132 (1909), pro parte.—"This variety "is distinguished from typical *S. lutea* by usually dark brown branchlets, longer and narrower, straplike, usually dark green leaves with the margins often nearly parallel and usually entire or only shallowly serrulate. The capsules also are shorter and on fairly short pedicels." Specimens are enumerated from California, Nevada, Arizona, Utah, New Mexico, Colorado, South Dakota and Wyoming.

S. lutea var. **platyphylla** Ball in Bot. Gaz. LXXI. 430 (1921).—*S. cordata* var. Bebb in King, U. S. Geol. Explor. 40th Parallel, v. 325 (1871).—"This variety "is separated from *S. lutea* by the broad ovate-lanceolate leaves and the more elongated pedicels 1.5–2.5 or 3 mm. long." Specimens are enumerated from Utah, Wyoming, Idaho, Oregon, Nevada.—Ed.

[2] **S. Farrae** var. **Walpolei** Coville & Ball in Bot. Gaz. LXXI. 435 (1921).—"*Salix Farrae Walpolei* is separated readily from the species by the pubescent pilose young twigs, the broader, more obovate leaves, the longer and laxer aments, and the shorter styles." It is known only from Alaska.—See also note on *S. Walpolei* in this Jour. I. 152.—Ed.

62b. S. **myrtillifolia** var. **brachypoda** Fernald.—See Schneider in this Jour. II. 195.

62c. S. **myrtillifolia** var. **lingulata** Ball.—See Schneider in this Jour. II. 195.

63. S. **pseudocordata** Rydberg.—See Schneider in this Jour. II. 195.

63b. S. **pseudocordata** var. **aequalis** Ball.—See Schneider in this Jour. II. 196.

63c. S. **pseudocordata** var. **cordata** Ball.—See Schneider in this Jour. II. 196.

Sect. XIII. ADENOPHYLLAE Schneider.—See Schneider in this Jour. I. 148.

64. S. **Chamissonis** Andersson.—*S. myrsinites* Chamisso.—See Schneider in this Jour. I. 149.

65. S. **Barclayi** Andersson.—See Schneider in this Jour. I. 150.—To this species also belongs according to specimens I have seen a Willow cultivated in European gardens under the name *S. Hoyeriana* Dieck (Neuheiten Offerte Nat. Arb. Zoeschen, 1889–90, 17). It has been mentioned by Dippel, Handb. Laubholzk. II. 285 (1892) as follows: *S. pyrolaefolia* var. "a. *Hoyeriana*, Hoyer's Weide. Diese von dem Reisenden Dr. Dieck's, Leutn. Hoyer, in dem Kaskadengebirge und zwar in dem Hochthal des Styn Creek,[1] einem Nebenflusse des Fraser aufgefundene, in den Zoeschener Baumschulen bereits kultivierte, von dort mir mitgeteilte, von Dr. Dieck *Sal. Hoyeriana* benannte (Neuheiten-Offerte 1889), von mir in Briefen als *Sal. pyrolaefolia* var. *cordata* Ledeb. form. *occidentalis* bezeichnete Weide gehört offenbar hierher und steht der *Sal. pyrolaefolia* γ *cordata* (*Sal. pyrolaefolia* γ *sabulosa*, *Sal. sabulsoa* Turczan. in herb.) sehr nahe."

65b. S. **Barclayi** var. **angustifolia** Andersson.—As I explained in this Jour. I. 151, this form may be identical with *S. conjuncta* Bebb and *S. Barclayi* var. *conjuncta* Ball.

65c. S. **Barclayi** var. **hebecarpa** Andersson.—See Schneider in this Jour. I. 151.

The form described by Andersson as *S. Barclayi* β, *latiuscula* is still absolutely uncertain, as I have already explained in this Jour. I, 152. Unfortunately the type is wanting in Herb. De Candolle at Geneva from which Andersson had received it. I doubt if *S. latiuscula* Fernald is really the same as Anderson's form.

To *S. Barclayi* may belong *S. cordifolia* β. *serrulata* Barratt.—See Schneider in Bot. Gaz. LXVI. 124.

66. S. **monticola** Bebb.—See Schneider in this Jour. I. 154 (1920).

66a. S. **pseudomonticola** Ball apud Standley in Contrib. U. S. Nat. Herb. XXII. 321 (1921). From Ball's short description I am unable to judge the real taxonomic value of this new species. He does not cite a

[1] I have not succeeded in finding a creek or river, situated northwest of Lytton according to Dieck (l. c.), bearing this name on any map of British Columbia at my disposal.

type, and I presume that he has published a complete diagnosis somewhere else. According to the statement "styles 1 mm. long" his species belongs to Sect. Adenophyllae, and must, indeed, be very similar to *S. monticola*.

67. **S. glaucophylloides** Fernald.—See Schneider in this Jour. I. 156.

67b. **S. glaucophylloides** var. **glaucophylla** Schneider.—See Schneider, in this Jour. I. 157.

68. **S. adenophylla** Hooker.—See Schneider in this Jour. I. 158.

69. **S. commutata** Bebb.—See Schneider in this Jour. I. 160.

69. **S. commutata** var. **sericea** Bebb.—See Schneider in this Jour. I. 160.

69. **S. commutata** var. **denudata** Bebb.—See Schneider in this Jour. I. 161.

69. **S. commutata** var. **puberula** Bebb.—See Schneider in this Jour. I. 162.

70. **S. Eastwoodiae** Cockerell.—See Schneider in this Jour. I. 163.

70b. **S. Eastwoodiae** var. **callicoma** Schneider in this Jour. I. 164.

71. **S. orestera** Schneider in this Jour. I. 164.

Sect. XIV. BALSAMIFERAE Schneider in this Jour. I. 167.

72. **S. pyrifolia** Andersson.—See Schneider in this Jour. I, 168.—Of Andersson's type (var. *laeta*) I have seen fragments of Bourgeau's male specimen from Winnipeg (Marais de la rivière aux Brochet, 22 June 1859) and also his female plant from Saskatchawan (Fort Pitt, 1859) preserved in the Herbarium at Stockholm in the Berlin Herbarium. Here is also a sterile piece of the type of Andersson's *S. pyrifolia* **obscura*, collected by Bourgeau on Aug. 23, 1858, at "Vallée des Arcs" in the (Canadian) Rocky Mountains. I am unable to ascertain the identity of this really obscure form not having seen the capsules described by Andersson.

73. **S. obtusata** Fernald.—See Schneider in this Jour. I. 171.

Sect. XV. CHRYSANTHEAE Koch.—See Schneider in this Jour. I. 212.

74. **S. Richardsonii** Hooker.—See Schneider in this Jour. I. 214.

75. **S. calcicola** Fernald.—See Schneider in this Jour. I. 215.—In the herbarium at Berlin-Dahlem I have seen a specimen from Labrador collected by Barth in 1847, but the exact locality is not given.

76. **S. Barrattiana** Hooker.—See Schneider in this Jour. I. 216.

76b. **S. Barrattiana** var. **Tweedyi** Bebb.—See Schneider in this Jour. I. 217.

77. **S. amplifolia** Coville.—See Schneider in this Jour. I. 218.

78. **S. Hookeriana** Barratt.—See Schneider in this Jour. I. 219.

78b. **S. Hookeriana** var. **laurifolia** J. K. Henry.—See Schneider in this Jour. I. 219.

78c. **S. Hookeriana** var. **tomentosa** J. K. Henry.—See Schneider in this Jour. I. 220.

79. **S. Piperi** Bebb.—See Schneider in this Jour. I. 221.

80. **S. laurentiana** Fernald.—See Schneider in this Jour. I. 222.

81. **S. alaxensis** Coville. See Schneider in this Jour. I. 223.—In the herbarium at Dahlem-Berlin I have seen the type of *S. Barrattiana vestita* Kurtz which I had referred with a ? to *S. alaxensis* (l. c.). It is a male specimen with some androgynous catkins, and represents typical *alaxensis*.

81b. **S. alaxensis** var. **longistylis** Schneider in this Jour. I. 225.

Sect. XVI. CANDIDAE Schneider in this Jour. I. 226.

82. **S. candida** Flügge.—See Schneider in this Jour. I. 226.

82b. **S. candida** var. **denudata** Andersson.—See Schneider in this Jour. I. 227.

83. **S. cryptodonta** Fernald in Rhodora XVI. 172 (1914).—This is the second Willow mentioned by me (in this Jour. I. 226) although I did not enumerate it. So far as I know there is only the type which was collected by Fernald & Wiegand in Newfoundland "by rapids below Seal Pond, Birchy Pond Stream, East Bank of Humber" on July 14, 1910 (No. 4267, fr.; G.). Fernald says that it is most closely related, apparently, to *S. californica* Bebb (= *S. Eastwoodiae*). In my opinion, this Willow does not belong to the Commutatae, and resembles in its pubescence a good deal *S. candida*. Unfortunately the male flowers and young female flowers are still unknown. Fernald states that the pedicel is "much longer than the nectary and barely shorter than the scale." According to my own observations the pedicel is from two to four times longer than the gland and mostly only half as long as the bracts. Without the pedicel the capsules measure about 7 mm. in length (Fernald says 8–10 mm., probably including the pedicel). The branches are not distinctly fuscous and shining. I add this little known species only provisionally to this section.

Sect. XVII. FULVAE Barratt.—See Schneider in this Jour. II. 66.

84. **S. Bebbiana** Sargent.—See Schneider in this Jour. II. 66.

84a. **S. Bebbiana** f. **luxurians**, stat. nov.—*S. rostrata* var. *luxurians* Fernald.—See Schneider in this Jour. II. 72.

84b. **S. Bebbiana** f. **capreifolia**, stat. nov.—*S. rostrata* var. *capreifolia* Fernald.—See Schneider in this Jour. II. 71.

84c. **S. Bebbiana** var. **perrostrata** Schneider in this Jour. II. 71.

84d. **S. Bebbiana** var. **projecta**, trans. nov.—*S. rostrata* var. *projecta* Fernald.—See Schneider in this Jour. II. 71.

85. **S. Geyeriana** Andersson.—See Schneider in this Jour. II. 71.

85b. **S. Geyeriana** var. **argentea** Schneider in this Jour. II. 74.

85c. **S. Geyeriana** var. **meleina** J. K. Henry.—See Schneider in this Jour. II. 74.

86. **S. Lemmonii** Bebb.—See Schneider in this Jour. II. 75.

86b. **S. Lemmonii** var. **Austinae** Schneider in this Jour. II. 79.

Sect. XVIII. ROSEAE Andersson.—See Schneider in this Jour. II. 81.

87. **S. pedicellaris** Pursh.—See Schneider in this Jour. II. 81.—As I have already pointed out I regard as the typical *pedicellaris* the form named

by Fernald var. *hypoglauca*. I am not yet convinced that there is a good variety with leaves green on both surfaces which according to Fernald should be taken for the type. The specimens of it mentioned by Fernald need further observation. His var. *tenuescens* is in my opinion nothing but a mere form.

87a. **S. pedicellaris** f. **tenuescens,** stat. nov.—*S. pedicellaris* var. *tenuescens* Fernald.—See Schneider in this Jour. II. 82.

88. **S. prolixa** Andersson.—See Schneider in this Jour. II. 82.

89. **S. fuscescens** Andersson.—See Schneider in this Jour. II. 83.

89b. **S. fuscescens** var. **hebecarpa** Fernald.—See Schneider in this Jour. II. 84.

Sect. XIX. GRISEAE Borrer.—See Schneider in this Jour. II. 14.

90. **S. sericea** Marshall.—See Schneider in this Jour. II. 14.

91. **S. coactilis** Fernald.—See Schneider in this Jour. II. 16.

92. **S. petiolaris** Smith.—See Schneider in this Jour. II. 16.

92b. **S. petiolaris** var. **rosmarinoides** Schneider in this Jour. II. 19.

93. **S. humilis** Marshall.—See Schneider in this Jour. II. 20.

93b. **S. humilis** var. **rigidiuscula** Robinson & Fernald.—? *S. humilis* var. *longifolia* f. *rigidiuscula* Andersson.—See Schneider in this Jour. II. 22. In his Fl. Europ. XXI. 168 (1890), Gandoger proposed under *S. tristis* four subspecies *S. dasytricha*, *S. graciliflora*, *S. iodanthera* and *S. leucodendron* which partly are nothing but typical *S. tristis*. Some may represent hybrids or forms of *S. humilis*.[1]

94. **S. tristis** Aiton.—See Schneider in this Jour. II. 24.

Sect. XX. DISCOLORES Barratt.—See Schneider in this Jour. II. 2.

95. **S. discolor** Muhlenberg.—See Schneider in this Jour. II. 2.

95a. **S. discolor** f. **rigidior** Anderson.—See Schneider in this Jour. II. 3.

95b. **S. discolor** var. **latifolia** Andersson.—See Schneider in this Jour. II. 3.

96. **S. Scouleriana** Barratt.—See Schneider in this Jour. II. 6.

96a. **S. Scouleriana** f. **poikila,** stat. nov.—*S. Scouleriana* var. *flavescens* J. K. Henry.—*S. Scouleriana* var. *poikila* Schneider in Jour. Arnold Arb. II. 12 (1920).

96b. **S. Scouleriana** var. **crassijulis** Schneider in this Jour. II. 12.—*S.*(*aurita?*) *brachystachys* Andersson in Ofv. Svensk. Vet.-Akad. Forh. XV. 121 (1858); in Proc. Am. Acad. IV. 60 (Sal. Bor.-Am. 15) (1858); in Walpers, Ann. Bot. 749 (1858).

97. **S. paradoxa** Kunth.—See Schneider in Bot. Gaz. LXV. 35 (1918).—As I have already stated (in this Jour. II. 13 [1920]) this Mexican species needs further observation. In Herb. Berol. I have seen some interesting specimens which probably belong to it. There is also Ehrenberg's No. 266 from Mineral del Monte (State ?) of which the pubescence of the

[1] *S. humilis* var. *keweenawensis* Farwell in Rep. Mich. Acad. Sci. VI. 206 (1904).—This form not mentioned by Schneider is described as a low form with the mature leaves densely tomentose.—Ed.

ovaries and fruits is very ferrugineous. It may represent a new species. In the mountains of Mexico there occur probably some more Willows, and also of those hitherto found our knowledge is rather imperfect. I already mentioned in Bot. Gaz. LXV. 39, the obscure *S. cinerea* Sesse & Moçino, non Linnaeus.

97b. **S. paradoxa** var. **ajuscana** Schneider.—*S. Pringlei* Rowlee, pro parte.—See Schneider in Bot. Gaz. LXV. 37.

98. **S. oxylepis** Schneider.—*S. latifolia* Martens & Galeotti.—See Schneider in Bot. Gaz. LXV. 34.

99. **S. Rowleei** Schneider.—*S. cana* Rowlee, pro parte.—See Schneider in Bot. Gaz. LXV. 31.

99b. **S. Rowleei ?** var. **cana** Schneider.—*S. cana* Rowlee, pro parte.—See Schneider in Bot. Gaz. LXV. 34.

An uncertain Willow probably closely related to the last one or representing a form or hybrid is *S. Pringlei* Rowlee. See Schneider in Bot. Gaz. LXV. 37.

Sect. XXI. PHYLICIFOLIAE Dumortier.—See Schneider in this Jour. I. 67.

100. **S. pulchra** Chamisso.—See Schneider in this Jour. I. 70.

100b. **S. pulchra** var. **yukonensis** Schneider in this Jour. I. 72.

101. **S. paraleuca** Fernald.—See Schneider in this Jour. I. 75.

102. **S. planifolia** Pursh.—See Schneider in this Jour. I. 75.—I also want to add a few words on the obscure *S. obovata* Pursh, Fl. Am. Sept. II. 611 (1814), which I mentioned when I dealt with *S. cordifolia* in Bot. Gaz. LXVI. 344 (1918). Pursh's species has been based on two different forms, one from Labrador collected by Colmatser, and the second from the "North West Coast. Nelson." It may be that the first specimen represents either *S. cordifolia* or *S. planifolia*, but it is impossible to ascertain the identity of the two forms mixed by the author without seeing his types which, unfortunately, seem to be lost.[1]

102b. **S. planifolia** var. **monica** Schneider in this Jour. I. 78.

103. **S. pennata** Ball.—See Schneider in this Jour. I. 81.

104. **S. pellita** Andersson.—See Schneider in this Jour. I. 82.

104a. **S. pellita** f. **psila** Schneider in this Jour. I. 83.

105. **S. subcoerulea** Piper.—See Schneider in this Jour. I. 84.

106. **S. bella** Piper.—See Schneider in this Jour. I. 86.

107. **S. Drummondiana** Barratt.—See Schneider in this Jour. I. 87.

108. **S. Jepsonii** Schneider in this Jour. I. 89.

Sect. XXII. BREWERIANAE Schneider in this Jour. I. 95.

109. **S. Breweri** Bebb.—See Schneider in this Jour. I. 95.

[1] In discussing, l. c., Andersson's *S. chlorophylla* I forgot to mention two of his forms described in 1867, as *S. chlorophylla denudata latifolia* and *angustifolia*. The last is nothing but var. *denudata* (typical *S. planifolia*), but of *f. latifolia* he says: "foliis obovatis, utrinque pure viridibus." Not quoting a type or even a locality it remains doubtful which form Andersson had in mind.

S. Nelsonii Ball which seems to be a species most closely related to or a variety of *S. planifolia* has been discussed by me (in this Jour. I. 80).

110. **S. delnortensis** Schneider in this Jour. I. 96.

Sect. XXIII. SITCHENSES Bebb.—See Schneider in this Jour. I. 91.

111. **S. sitchensis** Sanson.—See Schneider in this Jour. I. 92.

112. **S. Coulteri** Andersson.—See Schneider in this Jour. I. 93.

112b. **S. Coulteri** f. **parvifolia**—See Schneider in this Jour. I. 95.

SPECIES SECTIONIS INCERTAE.

113. **S. arbusculoides** Andersson.—See Schneider in this Jour. II. 84 (1920).

113b. **S. arbusculoides** var. **glabra** Andersson.—See Schneider in this Jour. II. 87.

114. **S. argyrocarpa** Anderson.—See Schneider in this Jour. II. 88.

115. **S. cana** Martens & Galeotti.—See Schneider in Bot. Gaz. LXV. 38.

116. **S. Endlichii** Von Seemen.—See Schneider in Bot. Gaz. LXV. 39.—I have not been able to find the type of this species in the herbarium at Berlein-Dahlem where it should be preserved.

BERLIN-DAHLEM, *March*, 1921.

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b. SOME REMARKS ON THE HYBRIDS HITHERTO OBSERVED AMONG THE AMERICAN WILLOWS

As I have already repeatedly stated I have not been able to make careful study of the forms which should be regarded as of hybrid origin. Nevertheless I wish to give an alphabetical enumeration of what has been mentioned in literature, and of those hybrids which according to my own observations seem to occur. I have to express my best thanks to Mr. A. Töpffer, the famous salicologist, at Munich, who has been kind in helping me compile for my personal use a list of the publications referring to such hybrids.

S. adenophylla × *S. cordata.* In 1880, Bebb had already collected and distributed specimens of this hybrid under no. 60 of his Herb. Salic. Am. It is first mentioned in Britton & Brown, Ill. Fl. III. 504 (1898).

? S. alaxensis × *S. Scouleriana.* A specimen which might be of this origin was collected by J. Macoun on June 22, 1902, in Yukon Territory, Hunker Creek (No. 54387, 0.).

S. alba [subsp.]—*S. Pameachiana* Andersson in K. Svensk. Vet.-Akad. Handl. VI. 48. (Monog. Salic.) 1867).—*S. alba* γ *Pameachiana* Andersson in De Candolle, Prodr. XVI², 212 (1868).—According to Bebb in Gard. & Forest VIII. 423, fig. 57 (1895), Andersson's *S. Pameachiana* represents a hybrid between *S. alba* and *S. lucida*, and it is not identical with *S. pameachiana* Barratt (not "Borr." as Andersson writes). Barratt's plant of which I do not know the type may belong to *S. alba* var. *vitellina* (as Carey said in Gray, Man. 428 [1848] or to *S. fragilis*, an opinion first held by Andersson in Proc. Am. Acad. Sci. IV. 55 (Sal. Bor.-Am. 9) (1858).

If this is correct the name can not be used for the combination *S. alba* × *lucida* which is represented by Bebb, Herb. Sal. no. 41, and Dudley, Sal. Cayug. no. 844. *S. alba* × *S. fragilis* × *S. lucida.* As Bebb, apud Gray, Man. ed. 6. 481 (1890), states, hybrids between *S. alba* and *S. fragilis* "are the commonest of introduced willows," and "these forms are rendered almost inextricable by a further cross, by no means rare, with our native *S. lucida.*" I do not doubt that such a cross may be met with at different localities.

S. alba × *S. lucida.* See under *S. alba Pameachiana.*

S. alba × *S. nigra.* In Gray, Man. ed. 6.481 (1890), Bebb says, that a hybrid of *S. nigra* "with *S. alba* var. *vitellina* has been found in Wayne Co., N. Y." by E. L. Hankenson. In Garden & Forest, VIII. 423, fig. 58 (1895), Bebb describes and figures this form as *S. nigra* × *alba.* I have not studied the specimens collected by Hankenson but I have some doubt as to the correctness of the interpretation. This form has been named *S. Hankensonii* by Dode in Bull. Soc. Bot. France, LV. 655, fig. D on p. 653 (1909).

S. amygdaloides × *S. longipes.* This hybrid was first observed by Glatfelter, see his notes on *Salix longipes* in Rep. Missouri Bot. Gard. IX. 49 (1898).

S. amygdaloides × *S. longipes* × *S. nigra.* See Glatfelter, l. c.

S. amygdaloides × *S. nigra.* This hybrid has been well described and figured by Glatfelter in Trans. Acad. Sci. St. Louis, VI. 427, pl. 1 (1894). I have seen plenty of material of it collected by Glatfelter and others, and I wish to propose the name × **S. Glatfelteri** for it.

S. anglorum × *S. cordifolia.* This hybrid does not apparently occur unfrequently in Labrador and in other regions where both parents meet. As I have already explained in Bot. Gaz. LXVI. 345 (1918), Rydberg's *S. Waghornei* in Bull. N. Y. Bot. Gard. I. 271 (1899), seems to represent such a hybrid so far as it can be judged by the poor type-specimen. I have seen a number of specimens which seem to be of this hybrid origin.

S. anglorum var. *araioclada* × *S. glauca* var. *glabrescens.* A specimen collected by R. A. Ware on dry talus slope near Burgess Pass, British Columbia, on August 13, 1907 (f.; G.; 18 to 40 cm. high), seems to represent such a cross. It needs, of course, further observation.

? *S. arctophila* × *S. Uva-ursi.* J. A. Allen, on August 20, 1881, collected a plant at Dead Islands, Labrador, on dry rocky ground growing with *S. Uva-ursi* (*S. Cutleri*), depressed, but a little larger than this species. The specimens bears No. 21, and may be of hybrid origin, the other parent being *S. arctophila.*

S. argyrocarpa × *S. planifolia.* This hybrid was first mentioned by Bebb apud Gray, Man. ed. 6.481 (1890), who stated under *S. argyrocarpa* that a hybrid with *S. phylicifolia* (= *S. planifolia*) had been detected by Mr. E. Faxon in Tuckerman's Ravine, White Mountains, N. H., but that leaves had already been collected by Dr. Gray as early as 1842. Faxon and Bebb described this hybrid later in 1890 in Bull. Torr.

Bot. Club. XVII, 149. I have had before me Faxon's splendid collections, and I have seen myself the plant in a living state on Mt. Washington. I take the liberty of proposing for it the name **S. Grayi**.

S. babylonica × *S. lasiandra.* This hybrid is mentioned by C. L. Anderson in Zöe I. 41 (1890), and also by Mott in Univ. Calif. Public. II. 196 (1905).

? *S. Barclayi* × *S. Scouleriana.* I have seen a specimen from Bennett, British Columbia, collected by F. A. Walpole on July 12, 1900 (No. 1082, fr. submat.; W.) which may represent such a cross.

? *S. Barrattiana* var. *Tweedyi* × *S. planifolia* var. *monica.* Like such a hybrid looks a specimen collected by A. Nelson in Wyoming, Willow Creek, May 22, 1897 (No. 2910, f.). The old female aments point to var. *Tweedyi* while otherwise the plant is hardly different from the western form of *S. planifolia.*

S. Bebbiana × *S. cordata.* Forms of such a hybrid have been distributed by F. F. Forbes, Brookline, Mass., who is an acute observer of hybrids among the American Willows, as *S. cordata* × *rostrata.*

S. Bebbiana × *S. discolor.* Of this hybrid, too, Forbes has distributed material under *S. discolor* × *rostrata.*

S. Bebbiana × *S. humilis.* This cross I know only from specimens distributed by Forbes as *S. humilis* × *rostrata.*

S. Bebbiana × *S. petiolaris.* This hybrid has also been found and distributed by Forbes as *S. petiolaris* × *rostrata.* Fernald, too, collected it in 1909 in Maine (No. 1687; G.).

S. Bebbii Gandoger, Fl. Europ. XXI. 167 (1890). This name has been used by the author for the cross *S. cordata* × *sericea.*

? *S. Bonplandiana* × *S. Gooddingii.* See Schneider in Bot. Gaz. LXV. 40 (1918).

? *G. Bonplandiana* × *S. Humboldtiana* var. *stipulacea.* See Schneider in Bot. Gaz. LXV. 40 (1918).

S. brachycarpa × *S. chlorolepis.* In Bot. Gaz. LXVI. 339 (1918), in dealing with *S. chlorolepis* I have mentioned that there are forms which must be regarded as true hybrids between these two species. I propose the name **S. gaspeensis** for this cross which is thus characterized:

A *S. chlorolepide* (et var. *antimima*) praecipue recedit filamentis basi vel ad medium plusminusve pilosis (rarius ex parte glabris), foliis ramulisque novellis densius sericeo-villosis. A *S. brachycarpae* forma in monte Albert collecta differt ramulis hornotinis foliisque adultioribus magis glabrescentibus epidermide superiore foliorum stomatibus plusminusve sparsis vel satis numerosis praedita filamentis interdum pro parte glabris.

TYPE LOCALITY: Mount Albert, Gaspé County, Quebec.

SPECIMENS EXAMINED: QUEBEC. Gaspé County: "common on the broad plateau at the top of Mt. Albert, above 1000 m.", July 26, 1881, *J. A. Allen* (type m., f.; G., W.); highest summit of same mountain, about 3150 m., July 31, 1881, same collector (f. m.; G.); on wet serpentine slopes, July 23, 1906, *Fernald & Collins* (No. 512 a, f.; G.)

S. brachycarpa × *S. pseudolapponum.* Hybrids of this origin seem to

occur rather frequently where the parents meet. See my note in Bot. Gaz. LXVI. 335 (1918).

S. candida × *S. cordata.* The first mention of this hybrid is made by Sargent in Gard. Chron. n. ser. x. 818 (1878) (see also Focke, Pflanzenmischlinge, 368 [1881]) who in a list mentions *S. candida* × *S. cordata* with the name *S. rubella* Bebb. I have not found this name rubella in any of Bebb's writings, and it is not cited by Rowlee and Wiegand in Bull. Torr. Bot. Club, XXIII. 201, pl. 276, fig. 1, 14–17 (1896) who give a good account of this hybrid. Bebb's name ought to be accepted for it. For further information see also Sheldon in Bull. Geol. Nat. Hist. Surv. Minn. IX. 585 (1896).

S. candida × *S. petiolaris.* This hybrid, too, was first mentioned so far as I know, by Sargent in Gard. Chron. n. ser. x. 818 (1878), with the name *S. Clarkei* Bebb (not *S. Clarkii* as printed l. c. and also in Focke, Pflanzenmischlinge, 368). According to Bebb's original notes published by Rowlee and Wiegand in Bull. Torr. Bot. Club, XXIII 196, the hybrid was discovered by Daniel Clarke, M. D., in 1872 in Hascoll's Swamp, near Flint, Mich. Rowlee and Wiegand give a good description of it. According to Sargent, l. c., Bebb also distinguished a var. *subpetiolaris* and a var. *subcandida* of *S. Clarkei.*

S. cinerea × *S. discolor.* Specimens taken by F. F. Forbes for this hybrid do not represent such a cross and are nothing but the European *S. nigricans* Smith according to Toepffer, in litt.

S. Clarkei Bebb see *S. candida* × *petiolaris.*

S. coactilis × *S. cordata.* See Fernald in Rhodora, VII. 203 (1907).

S. cordata × *S. discolor.* As Bebb already stated in Gray, Man. ed. 6, 482 (1890) hybrids between these two species may be met with where the parents meet.

S. cordata × *S. glaucophylloides* var. *glaucophylla.* See Toepffer, Salicet. exsicc. fasc. VIII. 298, no. 371 (1913). First distributed by Forbes in sched. as *S. cordata* × *glaucophylla.*

S. cordata × *S. incana.* This very interesting hybrid between the common east American species and the peculiar European *S. incana* Schrank was found by W. R. Dudley in 1885 and distributed by him under No. 857. See Dudley in Bull. Cornell Univ. II. 90 (1886).

S. cordata × *S. lucida.* Distributed by F. F. Forbes in 1908 and also mentioned by Knowlton and Deane in Rhodora, XVI. 108 (1914). It seems rather doubtful to me.

S. cordata × *S. monticola.* See Rydberg in Bull. Torr. Bot. Club, XXXIX 303 (1902). Rydberg regards as such a cross specimens from Utah, Big Cottonwood Canyon, below Silverlake, where there is no true *S. cordata*, and these forms need further careful observation.

S. cordata × *S. neo-Forbesii.* First mentioned by Forbes in Rhodora, XII. 10 (1909) as *S. cordata* × *subsericea.* See *S. petiolaris* × *sericea.*

S. cordata × *S. nigra.* The nonexistence of such a hybrid I have already discussed in my note XI in dealing with *S. cordata.*

S. cordata × *S. pedicellaris.* First observed by Forbes. See Toepffer, Salicet. exsicc. fasc. VIII. No. 372 (1913), and Knowlton and Deane in Rhodora, XVI. 108 (1914).

S. cordata × *S. petiolaris.* This cross has been found in several places, first by Bebb, later by Dudley and also by Forbes. See Dudley in Bull. Cornell Univ. II. 90 (1882).

S. cordata × *S. petiolaris* × *S. sericea.* See under *S. petiolaris* × *sericea.*

S. cordata × *S. sericea.* The oldest name for this hybrid seems to be *S. myricoides* Muhlenberg in Neue Schr. Ges. Naturf. Fr. Berlin, IV. 235, pl. VI. fig. 2 (1803). See also Bebb, Herb. Salic. Am. No. 12–17 (1879); apud Gray, Man. ed. 6.484 (1890), and Schneider, III. Handb. Laubh. I. 52 (1904), excl. synon. See also *S. Bebbii.*

S. cordata × *S. subsericea.* See *S. petiolaris* × *sericea.*

S. cordifolia × *S. planifolia.* Such a hybrid may be represented by A. C. Waghorne's No. 77 from Labrador, Pack's Harbor, July 28, 1892 (fr. immat.; A., C.). There is also a specimen collected by J. A. Allen in Labrador, Carrol Cave, beside a brook, August 6, 1882 (No. 13; "suberect or procumbent, about the size of 1 [*S. cordifolia*] or 6 [*S. planifolia*] nearly or quite as procumbent as 1, a little less so than 6. Outside on peaty soil, bank of a brook. Seems to come nearest 6, fruits all mixed with male flowers or abortive"), and Chateau, August 11, 1882 (No. 14; "nearly erect about 2 feet; outside; stony or gravelly sea-shore, not maritime, but at the nearest point to the shore producing plants not maritime; resembles no. 6"). If further observations should prove that this interpretation is correct or that the forms in question represent a distinct species or variety I think Allen's name should be connected with them.

S. discolor × *S. humilis.* See Töpffer, Salic. exsicc. fasc. VIII. 298 Nos. 373-4(1913), and Knowlton and Deane in Rhodora, XVI. 108 (1914).

S. discolor × *S. pyrifolia.* Fernald in Herb. Gray takes for this cross a specimen collected by him on July 22, 1909, in Maine, Washington County, Princeton, with the parents in a swampy thicket (No. 1675; st.).

? *S. Eastwoodiae* × *S. Scouleriana* (vel *S. Lemmonii*). A plant collected by A. A. Heller in Nevada, Washoe County, Divide south of Slide mountain, in granit, circ. 1500 m., July 5, 1913 (No. 10926, fr. submat.; C.) may be regarded as a hybrid of *S. Eastwoodiae* with one of the two other species.

? *S. exigua* × *S. melanopsis* var. *Bolanderiana.* See Schneider in Bot. Gaz. LXVII. 339 (1919). Besides the specimens there mentioned Heller's No. 10882, Nevada, Washoe County, log railroad north of Verdi, June 24, 1913, (fr. vix mat.; A., G.) looks much like such a hybrid.

? *S. Geyeriana* × *S. subcoerulea.* There have been collected by H. N. Patterson in Colorado, Clear Creek County, wet places near Empire in 1885 several specimens (no. 23, st.; sheet no. 107473 in C; no. 24, sheet 107805, C.; no. 27, sheet 107474, C.) and also by W. N. Suksdorf, Washington,

Spokane County, bank of Latah Creek, southeast of Spangle, May 15, July 20, 1916, (nos. 8638, 8639, f., 8640 m.; A.) which may represent forms of such a hybrid. They need, of course, further observation.

S. Geyeriana var. *meleina* × *S. sitchensis.* See J. K. Henry, Fl. S. Brit. Col. 98 (1915). I have seen one of Henry's specimens.

S. Glatfelteri Schneider. See *S. amygdaloides* × *nigra.*

S. glaucops × *S. monticola.* See Rydberg in Bull. Torr. Bot. Club, XXXIX 303 (1912). *Salix glaucops* of Rydberg is what I call *S. pseudolapponum* Von Seemen. I have not seen Garrett's no. 1671 from Utah, Big Cottonwood Canyon, Salt Lake County, August 23, 1905, which Rydberg takes for this hybrid.

? *S. Gooddingii* × *S. laevigata.* This hybrid seems to occur occasionally in California. See for instance A. A. Heller's no. 7950, Shasta County, on rocky banks of the Sacramento between Middle Creek Station and Keswicke, June 3, 1905 (fr.; A., St.; "a symmetrical shrub about ten feet high"). Needs further observation.

? *S. Gooddingii* × *S. lasiandra.* Such a hybrid may be represented by C. R. Ball's No. 1954, Calif. Univ. Farm, Davis, along Putah River, June 12, 1915 (fr.; G.; as *S. lasiandra*).

S. Grayi Schneider. See *S. argyrocarpa* × *planifolia.*

S. Hankensonii Dode. See *S. alba* × *nigra.*

S. herbacea × *S. Uva-ursi.* This is *S. Peasei* Fernald. See Schneider in Bot. Gaz. LXVII. 51 (1919).

S. humilis × *S. petiolaris.* Observed by Forbes and mentioned by Knowlton and Deane in Rhodora, XVI. 108 (1914).

S. humilis × *S. sericea.* See Rhodora, XVI. 108 (1914).

S. humilis × *S. tristis.* See Rhodora, XVI. 108 (1914).

? *S. laevigata* × *S. lasiandra.* A hybrid probably occasionally met with in California. Compare for instance A. A. Heller's No. 5329, Sonoma County, near Windsor on Russian River, April 3, 1902 (m., f.; G.), and No. 10849, Plumas County, near Marton Station, June 13, 1913 (fr.; G.).

S. longipes var. *Wardii* × *S. nigra.* See Glatfelder in Rep. Mo. Bot. Gard. IX. 49 (1898). As Ball stated the same cross is represented by Ball and Griggs, no. 64, from Washington, D. C., Canal at High Island, August 16, 1902 (st.).

S. lucida var. *intonsa* × *S. nigra.* According to Fernald in Herb. Gray his No. 1682, from New Brunswick, Westfield, Ingleside, river bank, with the parents, August 6, 1909 (fr. im.; G.) represents this hybrid. I believe that the interpretation of this excellent observer is correct.

? *S. monticola* × *S. pseudolapponum.* I am inclined to regard as such a hybrid J. G. Jack's specimens from Colorado, Pike's Peak, wagon road, about 3600 m., August 30, 1898 (fr.; A.).

S. myricoides Muhlenberg. See *S. cordata* × *sericea.*

S. neo-Forbesii Töpffer. See *S. petiolaris* × *sericea.*

S. pameachiana Barratt, Salic. Am. no. 16 (1840). See *S. alba-Pameachiana.*

S. Peasei Fernald. See *S. herbacea* × *Uva-ursi.*

S. petiolaris × *S. sericea.* Andersson's var. *subsericea* of *S. petiolaris* is now commonly regarded as representing this hybrid. In accepting this view I give the following synonymy already published by Töpffer. Some authors, however, still regard *S. subsericea* s. str. as a distinct species, and are able to distinguish hybrids between it and *S. petiolaris*, mentioned by Knowlton and Deane in Rhodora, XVI. 108 (1913).—*S. neo-Forbesii* Töpfer in Oestr. Bot. Ztschr. XLVI. 402 (1916). *S. petiolaris* 2. *subsericea* Andersson in Svensk. Vet.-Akad. Handl. VI. 109 (1867); in De Candolle, Prodr. XVI[2], 234 (1868).—*S. sericea* var. *subsericea* Rydberg in Britton, Man. 318 (1901).—*S. subsericea* Schneider, Ill. Handb. Laubholzk. I. 65 (1904), non Döll, (1859); Forbes in Rhodora XI. 9 (1909).

S. petiolaris × *S. tristis.* Observed by Forbes and mentioned by Knowlton and Deane in Rhodora, XVI. 109 (1914).

? *S. planifolia* var. *monica* × *S. subcoerulea.* This cross may be represented by P. A. Rydberg's No. 6812 from Utah, Saltlake County, Big Cottonwood Canyon, below Silverlake, July 8, 1905 (fr. submat.; N.).

S. rubella Bebb. See *S. candida* × *cordata.*

S. subsericea Schneider. See *S. petiolaris* × *sericea.*

BERLIN-DAHLEM, *June*, 1921.

c. SOME REMARKS ON THE GEOGRAPHICAL DISTRIBUTION OF THE AMERICAN WILLOWS[1]

Before I conclude my notes on American Willows I wish to say a few words in regard to the geographical distribution of the different sections and species. I suppose it will be of some use to students of the genus and of the flora of a certain state or region in general to give an enumeration of all the species according to their occurrence in the different states based on the material I have been able to examine. Of some states I have seen very little material, and, therefore, my indications are far from exhaustive. I wish to draw the attention of students to the flora of those states or regions where I can give but an incomplete account of the Willows which may occur in them.

Among the twenty-three sections enumerated by me in another note there are several groups peculiar to America and not represented in the Old World; namely, Sect. Nigrae, Bonplandianae and Longifoliae. Of the Nigrae the typical *S. Humboldtiana* is restricted to South America, probably ranging as far south as the Straits of Magellan, while its northern representative, *S. nigra*, reaches the 50th degree N. Lat. in Ontario. No other section covers such a wide area, as it is also found from the Atlantic to the Pacific coast.

[1] Reprinted from Vol. II. 197–204 of this Journal with the addition of the new species and new varieties published since by C. N. Ball, except *S. caudata* var. *parvifolia* which is included under *S. lasiandra* var. *caudata.*

The species of the Longifoliae, too, are widely spread from Guatemala (*S. taxifolia microphylla*) to the vicinity of Dawson in the Yukon Valley, Yukon Territory (*S. longifolia pedicellata*), and in the States from coast to coast.

The Bonplandianae inhabit a more restricted area from Guatemala (*S. Bonplandianae* forma) to northern California (*S. laevigata*) or even southern Oregon in the west, and Illinois to the District Columbia (*S. (longipes Wardii*) in the east.

Other sections indigenous to Central and North America and apparently of no distinct relationship to forms of the Old Word are: Mexicanae (three species) in Mexico; Wolffianae (one species) in Idaho, Wyoming, Montana, Oregon and Colorado.

The Candidae with *S. candida* (and possibly *S. cryptodonta*) are also a section the true affinity of which is by no means clear. It is a Willow of the northern United States from New Jersey to Montana, and of Canada from Labrador to Alberta and probably to British Columbia and the Great Slave Lake in the Northwest Territories.

The Fulvae, too, with *S. Bebbiana, Geyeriana* and *Lemmonii* are a distinctly American group of which *S. Bebbiana* is a widely spread member from New Mexico to the Yukon Territory, and from Newfoundland and New Jersey to northeastern Nevada and Washington.

Very limited is the range of the strange Brewerianae (California), and of the Sitchenses (Pacific coast from California to Southern Alaska).

Other sections, like the Cordatae, Adenophyllae, Balsamiferae, Discolores and Griseae, including only American forms, nevertheless show a more or less distinct affinity to Asiatic and European species, while the sections Reticulatae, Ovalifoliae, Glaucae, Phylicifoliae, Chrysantheae and Roseae combine species of the Old and New World.

On the following pages I give an alphabetic enumeration of the species met with in the different states of the United States and of Canada as well as in Mexico and South America. Those species indigenous to or hitherto known only from one state or district are marked with an asterisk. A question-mark signifies that the occurrence of the species or form in the region is still doubtful or that it is not yet clearly identified.

UNITED STATES

Alabama: S. nigra, longipes var. Wardii.

Alaska: S. alaxensis and var. longistylis, * amplifolia, arbusculoides, arctica and var. obcordata, Barclayi and var. hebecarpa, Bebbiana var. prostrata, * Chamissonis, commutata, Farrae var. Walpolei, fuscescens, * glacialis, glauca var. acutifolia, * lingulata, myrtillifolia, niphoclada, ovalifolia and vars. * camdensis and * subarctica, phlebophylla, * polaris (typica?) pulchra and var. yukonensis, reticulata, * rotundifolia and f. * pilosiuscula, Richardsonii, Scouleriana, sitchensis, * stolonifera and f. * subpilosa, * venusta (doubtful).

ARIZONA: S. amygdaloides, Bebbiana var. perrostrata, Bonplandiana var. Toumeyi, exigua var. stenophylla, Geyeriana, Gooddingii, ? irrorata, laevigata and var. araquipa, lutea var. ligulifolia, monticola, pseudocordata, Scouleriana.

ARKANSAS: S. cordata, humilis, longifolia, longipes var. Wardii, nigra and var. altissima.

CALIFORNIA: S. * Breweri, cascadensis, ? commutata, * Coulteri, * delnortensis, Eastwoodiae and var. * callicoma, exigua forma, Geyeriana var. argentea, Gooddingii, Jepsonii, laevigata and var. araquipa, lasiandra and vars. lancifolia, Abramsii and caudata, lasiolepis and vars. Bigelovii and Bakeri, Lemmonii and var. Austinae, lutea and var. ligulifolia, mackenzieana, melanopsis and var. Bolanderiana, orestera, planifolia var. monica, * Parishiana, petrophila and var. caespitosa, Scouleriana and var. * crassijulis, sessilifolia vars. Hindsiana and * leucodendroides, subcoerulea.

COLORADO: S. amygdaloides pilosiuscula, Bebbiana var. perrostrata, brachycarpa, candida, exigua vars. luteosericea and stenophylla, Geyeriana and var. argentea, lasiandra and var. caudata, irrorata, lutea and var. ligulifolia, monticola, nivalis and var. saximontana, petrophila, planifolia var. monica, pseudolapponum, Scouleriana, subcoerulea, Wolfii.

CONNECTICUT: S. Bebbiana, candida, discolor, cordata, humilis, longifolia, nigra, sericea, tristis.

DELAWARE: S. cordata, discolor, humilis, longifolia, lucida, nigra, tristis.

DISTRICT COLUMBIA: S. cordata, humilis, longifolia, longipes var. Wardii, nigra, sericea, tristis.

FLORIDA: S. Harbisonii, humilis, longipes, ? nigra, tristis.

GEORGIA: S. Harbisonii, humilis, longipes, nigra.

IDAHO: S. amygdaloides f. pilosiuscula, argophylla, Bebbiana var. perrostrata, bella, brachycarpa, commutata var. puberula, exigua and vars. nevadensis and tenerrima, Geyeriana and var. argentea, lasiandra var. caudata, lasiolepis var. Bigelovii, lutea var. platyphylla, mackenzieana, melanopsis, monochroma, pseudocordata, Scouleriana, sitchensis, subcoerulea, Wolfii var. idahoensis.

ILLINOIS: S. adenophylla, amygdaloides, Bebbiana, candida, cordata, discolor, glaucophylloides var. glaucophylla, humilis, longipes var. Wardii, lucida, missouriensis, sericea, tristis.

INDIANA: S. amygdaloides, Bebbiana, candida, cordata, discolor, glaucophylloides var. glaucophylla, humilis, longifolia, longipes var. Wardii, lucida, nigra pedicellaris, petiolaris, sericea, tristis.

IOWA: S. amygdaloides, Bebbiana, candida, cordata, discolor, humilis, longifolia, lucida, missouriensis, nigra, pedicellaris, petiolaris, sericea, tristis.

KANSAS: S. amygdaloides, cordata, longifolia, longipes var. Wardii, nigra.

KENTUCKY: S. cordata, discolor, humilis, longipes var. Wardii, missouriensis, nigra, sericea, tristis.

LOUISIANA: S. longifolia, ? longipes var. venulosa, nigra var. altissima.

MAINE: S. Bebbiana, candida, * coactilis, cordata, discolor, glaucophylloides, herbacea, longifolia var. Wheeleri, lucida, nigra, pellita, petiolaris var. rosmarinoides, planifolia, sericea, Uva-ursi.

MARYLAND: S. cordata, humilis, longifolia, longipes var. Wardii, nigra, sericea, ? tristis.

MASSACHUSETTS: S. amygdaloides, Bebbiana, candida, cordata, discolor, humilis, longifolia, lucida, nigra, pedicellaris, petiolaris, sericea, serissima, tristis.

MICHIGAN: S. adenophylla, amygdaloides, Bebbiana, candida, cordata, discolor, glaucophylloides var. glaucophylla, humilis, longifolia vars. pedicellata and Wheeleri, nigra, pellita, pedicellaris, petiolaris, sericea, serissima.

MINNESOTA: S. amygdaloides, Bebbiana, candida, cordata, discolor, humilis, longifolia var. pedicellata, nigra, ? pedicellaris, petiolaris, pyrifolia.

MISSISSIPPI: S. cordata, humilis, longifolia, longipes var. Wardii, missouriensis, nigra, tristis.

MISSOURI: S. amygdaloides, cordata, discolor, humilis, longifolia, longipes var. Wardii, missouriensis, nigra, sericea, tristis.

MONTANA: S. amygdaloides, Barclayi and var. conjuncta, Barrattiana var. Tweedyi, bella, brachycarpa, candida, cascadensis, commutata, ? Drummondiana, exigua and var. tenerrima, Farrae, Geyeriana and var. meleina, lasiandra var. caudata, lutea and var. famelica, mackenzieana, melanopsis, monochroma, monticola, nivalis and var. saximontana, petrophila, planifolia var. monica, pseudocordata, pseudolapponum, pseudomonticola, Scouleriana, serissima, sitchensis, subcoerulea, vestita var. erecta, Wolfii var. idahoensis.

NEBRASKA: S. amygdaloides, Bebbiana var. perrostrata, cordata, exigua var. luteosericea, Geyeriana, humilis, longifolia, missouriensis, nigra, tristis.

NEVADA: S. amygdaloides f. pilosiuscula, Bebbiana var. perrostrata, ? commutata, Eastwoodiae and var. callicoma, exigua and var. nevadensis, Gooddingii, laevigata, lasiandra and var. caudata, lasiolepis var. Bigelovii, Lemmonii, lutea and vars. ligulifolia and platyphylla, nivalis var. saximontana, orestera, petrophila and var. caespitosa, pseudocordata, Scouleriana, subcoerulea.

NEW HAMPSHIRE: S. argyrocarpa, Bebbiana, cordata, discolor, herbacea, longifolia, lucida, nigra, planifolia, pyrifolia, ? serissima, Uva-ursi.

NEW JERSEY: S. Bebbiana, candida, cordata, discolor, humilis, longifolia, lucida, nigra, petiolaris, sericea, serissima, tristis.

NEW MEXICO: S. amygdaloides and var. Wrightii, Bebbiana var. perrostrata, ? cordata, exigua var. stenophylla, Gooddingii, irrorata, lasiandra

and var. caudata, lutea var. ligulifolia, monticola, nivalis var. saximontana, planifolia var. monica, petrophila, ? pseudolapponum, Scouleriana, subcoerulea.

NEW YORK: S. amygdaloides, Bebbiana, candida, cordata, discolor, humilis, longifolia, lucida, nigra, pedicellaris, petiolaris, pyrifolia, sericea, serissima, tristis, Uva-ursi.

NORTH CAROLINA: S. cordata, Harbisonii, humilis, longipes, nigra, sericea, tristis.

NORTH DAKOTA: S. ? Bebbiana, candida, ? cordata, humilis, longifolia, lucida, lutea and var. famelica, serissima.

OHIO: S. adenophylla, amygdaloides, Bebbiana, candida, cordata, discolor, glaucophylloides var. glaucophylla, humilis, longifolia, lucida, nigra, petiolaris, sericea, serissima.

OKLAHOMA: S. amygdaloides, exigua var. stenophylla, longipes var. Wardii, nigra.

OREGON: S. amygdaloides f. pilosiuscula, argophylla, Barclayi var. conjuncta, Bebbiana var. perrostrata, brachycarpa, commutata and vars., ? Eastwoodiae, exigua, fluviatilis, Geyeriana and vars., Hookeriana and var. tomentosa, lasiandra and vars., lasiolepis var. Bigelovii, Lemmonii var. Austinae, lutea and var. platyphylla, mackenzieana, melanopsis, monochroma, nivalis var. saximontana, petrophila, Piperi, pseudocordata, Scouleriana, sessilifolia and var. Hindsiana, sitchensis, subcoerulea, vestita var. erecta, Wolfii var. idahoensis.

PENNSYLVANIA: S. adenophylla, Bebbiana, candida, cordata, discolor, humilis, longifolia, lucida, nigra, petiolaris, sericea, tristis.

RHODE ISLAND: S. Bebbiana, cordata, discolor, humilis, longifolia, nigra, sericea, tristis.

SOUTH CAROLINA: S. ? cordata, Harbisonii, ? humilis, longipes, nigra sericea.

SOUTH DAKOTA: S. amygdaloides, Bebbiana var. perrostrata, cordata, discolor, exigua var. luteosericea, lasiandra var. caudata, longifolia, lucida, lutea and vars. famelica and ligulifolia, nigra, Scouleriana.

TENNESSEE: S. cordata, nigra, longipes var. Wardii, tristis.

TEXAS: S. amygdaloides and var. Wrightii, ? cordata, exigua var. stenophylla, Gooddingii, humilis, ? irrorata, longifolia var. angustissima, longipes var. venulosa, nigra and vars. altissima and Lindheimeri.

UTAH: S. amygdaloides f. pilosiuscula, Bebbiana var. perrostrata, brachycarpa, exigua vars. nevadensis and ? tenerrima, Geyeriana, lasiandra var. caudata, lutea and vars. ligulifolia and platyphylla, monticola, nivalis var. saximontana, petrophila, planifolia, pseudocordata, ? pseudolapponum, Scouleriana.

VERMONT: S. amygdaloides, Bebbiana, candida, cordata, discolor, humilis, longifolia, lucida, nigra, pellita, planifolia, pyrifolia, sericea, ? serissima, Uva-ursi.

VIRGINIA: S. ? cordata, Harbisonii, humilis, longipes and var. Wardii, nigra, sericea, tristis.

WASHINGTON: S. amygdaloides f. pilosiuscula, argophylla, Barclayi and var. conjuncta, Bebbiana var. perrostrata, bella, cascadensis, commutata with its three varieties, exigua, Geyeriana var. meleina, Hookeriana, lasiandra and vars. caudata and lancifolia, mackenzieana, melanopsis, monochroma, nivalis and var. saximontana, pedicellaris, pennata, pseudocordata, Scouleriana, sessilifolia, sitchensis, subcoerulea.

WEST VIRGINIA: S. ? cordata, humilis, nigra, sericea.

WISCONSIN: S. adenophylla, amygdaloides, Bebbiana, candida, cordata, discolor, glaucophylloides var. glaucophylla, humilis, longifolia vars. pedicellata and Wheeleri, pedicellaris, nigra, ? petiolaris, serissima, tristis.

WYOMING: S. ? Barclayi, Barrattiana var. Tweedyi, brachycarpa, candida, cascadensis, * Dodgeana, exigua and vars. stenophylla and tenerrima, Geyeriana and var. argentea, lasiandra var. caudata, lutea vars. ligulifolia and platyphylla, mackenzieana, monochroma, monticola, nivalis var. saximontana, petrophila, planifolia monica, pseudocordata, pseudolapponum, Scouleriana, subcoerulea, Wolfii and var. idahoensis.

CANADA

ALBERTA: S. anglorum var. araioclada, arbusculoides, Barclayi, Barrattiana, Bebbiana, bella, brachycarpa and var. glabellicarpa, candida, commutata, Drummondiana, exigua, Farrae, glauca vars. acutifolia and glabrescens, lasiandra and var. caudata, longifolia var. pedicellata, lutea, Maccalliana, mackenzieana, melanopsis, monochroma, myrtillifolia, nivalis and var. saximontana, petiolaris var. rosmarinoides, planifolia var. monica, petrophila, pseudocordata, pseudolapponum, Scouleriana, serissima, vestita var. erecta.

BRITISH COLUMBIA: S. alaxensis, anglorum var. araioclada, arctica and var. subcordata, argophylla, Barclayi and var. conjuncta, Barrattiana, Bebbiana var. perrostrata, candida, commutata, ? Drummondiana, exigua, Farrae, Geyeriana var. meleina, glauca vars. acutifolia and glabrescens, Hookeriana, lasiandra and vars., Maccalliana, mackenzieana, melanopsis, monochroma, nivalis and var. saximontana, ? petiolaris var. rosmarinoides, petrophila, ? prolixa, pseudocordata, ? pyrifolia, pulchra, Richardsonii, Scouleriana, sessilifolia, sitchensis, vestita var. erecta, and spec. coll. Eastwood.

LABRADOR: S. adenophylla, anglorum, arctophila, argyrocarpa, calcicola, candida, ? cordata, cordifolia and vars. atra, hypoprionota and Macounii, herbacea, laurentiana, myrtillifolia, pellita, planifolia, pyrifolia, vestita, Uva-ursi.

MANITOBA: S. adenophylla, amygdaloides, Bebbiana, brachycarpa, calcicola, candida, ? cordata, discolor, longifolia var. pedicellata, lucida, Maccalliana, petiolaris var. rosmarinoides, ? planifolia, pyrifolia, serissima.

NEW BRUNSWICK: S. Bebbiana, candida, cordata, discolor, lucida, nigra, pellita, petiolaris, pyrifolia, sericea.

NEWFOUNDLAND: S. anglorum var. kophophylla, Bebbiana and var.

* projecta, calcicola, candida, ? cordata, cordifolia and var. Macounii, discolor, glaucophylloides, * leiolepis, lucida, myrtillifolia var. brachypoda, pellita, pyrifolia, reticulata, Uva-ursi, vestita.

NOVA SCOTIA: S. Bebbiana, ? cordata, discolor, lucida, pyrifolia.

NORTHWEST TERRITORIES: S. adenophylla, alaxensis, anglorum, arbusculoides, arctophila, Bebbiana and var. perrostrata, brachycarpa, candida, chlorolepis, cordifolia, * desertorum, * fullertonensis, glauca var. acutifolia, herbacea, * hudsonensis, longifolia var. pedicellata, mackenzieana, myrtillifolia, niphoclada, ? planifolia, pyrifolia, reticulata, Richardsonii, Uva-ursi, vestita.

ONTARIO: S. adenophylla, amygdaloides, Bebbiana, calcicola, cordata, discolor, humilis, glaucophylloides var. glaucophylla, humilis, Maccalliana, myrtillifolia, nigra, pellita, petiolaris and var. rosmarinoides, pyrifolia, serissima.

QUEBEC: S. adenophylla, amygdaloides, anglorum vars. * antiplasta, araioclada and kophophylla, arctophila, argyrocarpa, Bebbiana, calcicola, candida and var. denudata, chlorolepis and var. * antimima, cordata, cordifolia and vars., discolor, fuscescens var. hebecarpa, glaucophylloides, herbacea, * laurentiana, longifolia var. pedicellata, lucida, myrtillifolia, nigra, * obtusata, * paraleuca, pellita, petiolaris var. rosmarinoides, planifolia, pyrifolia, reticulata, serissima, Uva-ursi, vestita.

SASKATCHEWAN: S. Bebbiana, brachycarpa, candida, ? cordata, discolor, longifolia var. pedicellata, lutea, Maccalliana, myrtillifolia, petiolaris, rosmarinoides, pyrifolia, Scouleriana, serissima.

YUKON TERRITORY: S. alaxensis and var. * longistylis, arbusculoides, ? anglorum, arctica, Bebbiana var. perrostrata, glauca var. acutifolia, lasiandra and var. lancifolia, longifolia var. pedicellata, myrtillifolia, pulchra and var. yukonensis, reticulata, Richardsonii, Scouleriana, and spec. coll. Eastwood.

WESTERN GREENLAND: S. * anamesa, anglorum, arctophila, cordifolia, glauca var. ovalifolia, herbacea, Uva-ursi.

CENTRAL AMERICA

CUBA: S. longipes.

GUATEMALA: S. Bonplandiana forma, Humboldtiana var. stipulacea.

MEXICO: S. amygdaloides var. Wrightii, Bonplandiana and vars., * cana, * Endlichii, exigua var. stenophylla, Gooddingii, * Hartwegii, Humboldtiana var. stipulacea, * jaliscana, lasiolepis, longifolia var. angustissima, * mexicana, nigra var. Lindheimeri, * oxylepis, * paradoxa and var. * ajuscana, * Rowleei and var. * cana, * Schaffneri, taxifolia and var. * microphylla.

SOUTH AMERICA: S. Humboldtiana and var. * Martiana.

d. ANALYTICAL KEYS TO THE SPECIES OF AMERICAN WILLOWS

In the following keys an attempt has been made to facilitate the determination of incomplete material, that is, of specimens of one sex or with leaves only. To accomplish this three different keys are necessary one for specimens with staminate flowers, one for specimens with pistillate flowers, and one for specimens with mature leaves. Some species, however, do not appear in each of the three keys, as the staminate flowers of several species are still unknown, while of two species the pistilate flowers are unknown. In the key for staminate specimens it has not always been possible to find sufficient differences in the flowers of some closely related species to make their determination without leaves possible. The key for the leaf specimens has presented ever greater difficulties, as the leaves of Salix are of a comparatively uniform character and within many species are variable in size, serration and pubescence. It must therefore be stated that this key allows in many cases only an approximate determination if the corresponding flowers are not at hand and the determinations arrived at must be used with caution, unless they can be verified by comparison with correctly determined material.

The number prefixed to the species apply to their sequence in the systematic enumeration of all American species which will appear in the next issue of this Journal together with a complete index which will conclude this series of Notes on American Willows.

I. CLAVIS SPECIERUM SECUNDUM SPECIMINA MASCULA[1]

(Specimina feminea, vide p. 97, sterilia, vide p. 107)

A. **Flores glandulis duobus (ventrali et dorsali) instructi** (B, vide p. 94.)

a. Stamina 3 v. plura (b, vide p. 92)

Amenta coetanea vel serotina, fere semper pedunculo distincto foliolato instructa, nunquam normaliter in axillis foliorum maturorum in autumno vel mense Februario apparentia.

*Amenta satis evoluta vix ultra 8–10 mm. crassa, elongato-cylindrica, saepe flexuosa, pleraque ultra 6-plo longiora quam crassa; filamenta saepissime subcurvata non stricta.

Ramuli floriferi rubro-fusci ad purpurascentes.

Foliola pedunculorum utrinque concoloria et stomatifera; bracteae plusminusve lanceolatae et acutiusculae; ramuli fragiles, floriferi satis intense fusci vel purpurascentes. 1. *S. Humboldtiana* 2. *S. nigra.*

Foliola pedunculorum subtus (initio saepe indistincte) pallidiora, estomatifera (vel in *S. Harbisonii* stomatibus paucis instructa); bracteae plusminusve latiores obtusioresque; ramuli (*S. Harbisonii* excepta) tenaces.

Ramuli fragiles; folia superne stomatibus paucis instructa; bracteae subacutiores. . . . . 12. *S. Harbisonii.*

Ramuli tenaces, floriferi saepissime satis sordide vel obscure brunnescentes vel subcinerascentes.

Amenta normaliter ultra 4 cm. longa, foliolis pedunculorum satis longiora. . . . . 10. *S. laevigata* et 11. *S. longipes*

[1] Of the following species the male plant is still unknown: *S. cryptodonta, S. Drummondiana, S. glacialis, S. latiuscula, S. laurentiana, S. Nelsonii, S. obtusata, S. paraleuca, S. pellita, S. Schaffneri.*

Amenta ut videtur vix ultra 3.5 cm. longa et 8 mm. crassa, foliolis pedunculorum subaequilonga; ramuli floriferi saepissime plusminusve tomentosuli . . . . . 8. *S. jaliscana.*

Ramuli floriferi flavescentes, flavo-olivacei, viridi-flavescentes vel sordide cinereo-brunnescentes; ramuli fragiles.

Foliola pedunculorum utrinque concoloria et stomatifera, lineari-lanceolata. . . . . 3. *S. Gooddingii.*

Foliola pedunculorum subtus discoloria, superne vix stomatifera, magis ovato-lanceolata . . . . . 4. *S. amygdaloides.*

**Amenta satis evoluta 10–13 mm. crassa, ovato- vel elliptico-cylindrica, satis stricta, pleraque tantum 2–4(–5)-plo longiora quam crassa, filamenta saepe stricta; ramuli saepissime nitiduli.

Ramuli floriferi plusminusve rubro-brunnei vel purpurascentes. 6. *S. lasiandra.*

Ramuli floriferi plusminusve flavo- vel olivaceo-brunnei vel olivaceo-fusci.

Foliola pedunculorum utrinque concoloria; amenta 2.5–4 cm. longa. 7. *S. lucida.*

Foliola pedunculorum subtus discoloria; amenta vix ultra 1.5 cm. longa. 5. *S. serissima.*

Amenta serotina, autumno (vel in mense Februario) in axillis foliorum normalium apparentia, 4–6 cm. (in var. *Toumeyi* vix ultra 3 cm.) longa; folia subtus discoloria . . . . . 9. *S. Bonplandiana.*

b. STAMINA TANTUM 2 (VEL IN *S. Uva-ursi* TANTUM 1)

1. *Filamenta basi vel ad medium dense longe villosa; bracteae flavescentes; folia utrinque fere aequaliter stomatifera*

Amenta tantum 5–13(–18) mm. longa et circ. 8 mm. crassa; antherae minimae plusminusve globosae vel subglobosae; folia minima vel parva, linearia vel lineari-lanceolata, vix ultra 30:3.5 mm. magna . . . . . 13. *S. taxifolia.*

Amenta longiora vel antherae ellipticae vel folia majora (confer clavem in Bot. Gaz. LXVII, 312. Vide species sequentes: 14. *S. sessilifolia*, 15. *S. fluviatilis* 16. *S. Parishiana*, 17. *S. argophylla*, 18. *S. exigua*, 19. *S. melanopsis* et 20. *S. longifolia.*[1]

2. *Filamenta basi breviter et laxius villosula vel glaberrima; bracteae flavescentes vel fuscescentes; folia superne haud vel satis sparse stomatifera.*

Filamenta plusminusve pilosa (interdum ima basi tantum pilis paucis instructa); bracteae concolores, flavescentes vel violaceae.

Amenta serotina, pseudoterminalia, anguste cylindrica vel minima pauciflora, pedunculis nudis iis saepe subaequilongis suffulta; glandulae 2 vel interdum plures pseudodiscum lobulatum formantes.

Bracteae intus plusminusve brevi-pilosae vel utrinque sericeae; folia coriacea, superne conspicue inciso-reticulata.

Antherae violaceae; bracteae intus tantum brevipilosae; frutex prostratus; petioli elongati ad 3 cm. longi . . . . . 21. *S. reticulata.*

Antherae flavae; bracteae utrinque plusminusve sericeae; frutex prostratus vel erectus; petioli breves gemmis vix longiores. 22. *S. vestita.*

Bracteae glabrae vel tantum parce ciliatae; folia tenuiora, superne vix inciso-reticulata; frutices prostrati, interdum minimi, suffruticulosi. 24. *S. nivalis.*

Amenta coetanea, rarius serotina, lateralia, ovata vel cylindrica, semper multiflora sed interdum parva, pedunculis semper foliolatis.

Antherae minimae ellipsoideo-globosae; amenta sub anthesi subglobosa vel ellipsoidea, 5: 5 ad 10: 8 mm. magna . . . . . 41. *S. brachycarpa.*

Antherae magis ellipsoideae, longiores; amenta saepissime ultra 10–15 mm. longa et crassiora (confer clavem in Bot. Gaz. LXVII, 43).[2] Vide species sequentes 47. *S. cordifolia*, 43. *S. desertorum*, 46. *S. glaucae* varietates, 45. *S. Maccalliana*, 44. *S. pseudolapponum* et etiam species satis incerte cognitae 42. *S. niphoclada* et 49. *S. lingulata.*

[1] I am not able to give a key for the male specimens of these species. The species of Sect. *Longifoliae* need a much closer study in the field.

[2] With our present knowledge it is almost impossible to determine these species from male specimens only.

Filamenta omnino glabra.

Stamen unicum; folia adulta discoloria, glabra; frutex depressus vel prostratus. 26. *S. Uva-ursi.*

Stamina semper 2.

Folia utrinque concoloria vel subconcoloria, etiam superne stomatifera minima vel parva, rarius ultra 25 mm. longa latave; amenta serotina tenuia, pauci-(rarius multi-)flora; fruticuli minimi, saepe suffruticulosi, ramulis tenuissimis, fere semper radicantibus.

Bracteae concolores, flavescentes vel violascentes, glabrae vel apice tantum parce ciliatae; folia adulta sicca nunquam persistentia.

Folia utrinque obtusa vel acutiuscula, integra, non reticulata. 30. *S. Dodgeana.*

Folia utrinque rotundata, basi saepe cordata, crenato-serrata, reticulata. 27. *S. herbacea.*

Bracteae bicolores, apice plusminusve purpurascentes, distincte ciliatae vel etiam facie parce pilosae; folia adulta sicca per secundum annum persistentia, integerrima.[1]

Amenta minima, 3–8-flora; folia orbicularia vel late ovalia, adulta sicca anno secundo decidua . . . . . 28. *S. rotundifolia.*

Amenta multiflora, ad 23 mm. longa; folia adulta per plures annos persistentia, elliptica vel lineari-lanceolata . . . 29. *S. phlebophylla.*

Folia subtus discoloria vel bracteae bicolores et longe sericeae; fruticuli vel frutices.

Bracteae bicolores, apice vel pro parte maxima fuscae vel brunneae, versus apicem longe sericeae (pilis sericeis bractea vix vel paullo brevioribus), interdum apice tantum longe ciliatae.

Amenta coetanea vel saepe serotina et in apice pedunculi foliiferi vel ramuli brevis lateralis; fruticuli vel frutices parvi, ramis prostratis radicantibus vel subterraneis, floriferis tantum adscendentibus vix ad 15–20 cm. altis (in formis *S. arcticae* interdum altioribus). (Confer clavem in Bot. Gaz. LXVII. 39–41). Vide species sequentes 33. *S. anglorum*, 34. *S. arctica*, 37. *S. arctophila*, 35. *S. ovalifolia*, 32. *S. petrophila* et 36. *S. stolonifera*.[2]

Amenta praecocia, sessilia vel subsessilia, vel coetanea sed lateralia; frutices erecti ramis strictis.

Antherae violaceae, minimae, globosae; amenta parva, pedunculo brevi excluso vix ultra 1.5: 0.7 cm. magna; foliola subtus dense adpresse sericea . . . . . 114. *S. argyrocarpa*

Antherae flavae, magis ellipsoideae.

Amenta coetanea pedunculo excluso vix ad 12(–18): 8 mm. magna; folia foliolaque integerrima, rarius infima tenuiter denticulata. 50. *S. Wolfii.*

Amenta autumno in axillis foliorum normalium apparentia vel primo vere praecocia, sessilia subsessiliaque, ad 8.8 : 0.7–0.8 cm. magna.

Ramuli floriferi tomentosi . . . . . 51. *S. Hartwegii.*

Ramuli floriferi glabri . . . . . 52. *S. mexicana*

Bracteae concolores, flavescentes et fere glabrae vel stramineae flavo-brunnescentesve et breviter sericeo-villosae (pilis bractea brevioribus) vel subdiscolores sed tantum villosae vel pilis sericeis tenuissime praeditae; frutices prostrati vel saepe erecti, 0.3 ad 1, rariter ad 2 m. alti.

Amenta minima vel parva, 5–10 mm. longa vel in *S. niphoclada* ad 22: 4 mm. magna et laxiflora; petioli vix ultra 2 mm. longi.

Bracteae subglabrae vel extus dense pilosae; folia superne stomatifera . . . . . 40. *S. chlorolepis.*

Bracteae utrinque pilis satis brevibus sericeo-pilosae; folia superne haud stomatifera . . . . . 42. *S. niphoclada.*

[1] See also 25. *S. polaris* et 31. *S. cascadensis* in which the dorsal gland seems to be always or mostly absent.

[2] I am not able to give a reliable key to distinguish the male plants of these species, and I refer to the statements given l. c.

Amenta 1.2–3.5 cm. longa et ultra 5 mm. crassa; petioli saepissime ultra 2 mm. longi. Vide formas diversas sub 48. *S. anamesa*, 47. *S. cordifolia* et 46. *S. glauca* enumeratas.

B. **Flores glandula tantum unica (ventrali) instructi.**

a. STAMEN UNICUM

Antherae violaceae; bracteae florum plusminusve distincte fuscescentes. 111. *S. sitchensis*.

Antherae aureae; bracteae florum flavescentes vel ad apicem flavo-brunneae. 112. *S. Coulteri*.

b. STAMINA SEMPER 2, FILAMENTIS INTERDUM PRO PARTE COALITIS

1. *Filamenta basi plusminusve (interdum tantum parce) pilosa*

Bracteae florum flavae vel flavobrunneae vel interdum ad apicem satis rubro-brunnescentes, satis breviter pilosae (pilis etiam ad apicem quam bractea brevioribus).[1]

Ramuli floriferi pruinosi vel amenta plusminusve coetanea et folia novella pilis etiam fulvis praedita . . . . . 85. *S. Geyeriana*.

Ramuli floriferi epruinosi; amenta plusminusve praecocia; folia novella tantum argenteo- vel griseo-pilosa . . . . . 84. *S. Bebbiana*.

Bracteae florum distincte bicolores, apice vel pro parte maxima fuscae, praesertim ad apicem pilis bracteam aequilongis vel ea longioribus sericeis instructae.[2]

Amenta coetanea vel satis serotina, pedunculis foliola normalia 2–5 gerentibus suffulta, satis tenuia, vix ultra 1 cm. crassa.[3]

Foliola pedunculorum semper margine dense minime glanduloso-denticulata. 70. *S. Eastwoodiae*.

Foliola pedunculorum haud vel tantum versus basim sparse glanduloso-denticulata . . . . . 86. *S. Lemmonii*. 71. *S. orestera*.

Amenta praecocia, sessilia vels ubsessilia, basi normaliter foliolis tantum squamiformibus parvis paucis suffulta.[4]

Amenta satis tenuia, anguste cylindrica, vix ad 1 cm. crassa. 90. *S. petiolaris*. 92. *S. sericea*.

Amenta satis crassa, saepe ovoideo- vel ellipsoideo-cylindrica, 1–1.5 cm. crassa.

Ramuli floriferi leviter pruinosi . . . . 86. *S. Lemmonii* var. *Austinae*.

Ramuli nunquam pruinosi. Confer 95. *S. discolorem* et 96. *S. Scouleriannam* et species mexicanas 97. *S. paradoxam* et 98. *S. oxylepidem*.

2. *Filamenta semper omnino glaberrima.*[5]

Folia subtus discoloria.

Folia circumcirca dense et minute glanduloso-serrata. . 63. *S. Chamissonis*.

Folia integerrima vel versus basim tantum sparse denticulata. 89. *S. fuscescens*.

[1] Of the very rare Californian 109. *S. Breweri* the bracts are also yellowish but their pubescence consists of long thin sericeous hairs and the gland is remarkably slender and more than half as long as the bract.

[2] The very little known Mexican 115. *S. cana* has fuscous bracts with a very short pubescence, small coetaneous ellipsoidal aments, more or less tomentose branches and linear-lanceolate leaves. Of the apparently very closely related 116. *S. Endlicheri* with glabrous branchlets I have not yet seen material. The male plant of 91. *S. coactilis* from Maine is still very little known; it seems to have violet anthers.

[3] Of 77. *S. amplifolia* the filaments are sometimes slightly pilose at base. This species has large aments measuring up to 6.5: 1.7 cm.

[4] Of the rare 103. *S. pennata* from Washington and Oregon the filaments possess only very few hairs at their base. Sometimes also the filaments of 9. *S. Piperi* show a few hairs. Both have glabrous purpurascent rather shining flowering branches.

[5] The determination of the male plants of the following species is often a very difficult task owing partly to the precociousness of the aments and the great similarity as a whole of the male flowers. It mostly needs a careful comparison of a well-collected series of flowering specimens of each species to thoroughly establish the differences between them without the aid of the leaves.

Folia utrinque concoloria vel subtus paullo pallidiora et anni praeteriti plusminusve persistentia.

Ramuli floriferi saepissime 2-foliati; folia utrinque viridia, adulta sicca haud persistentia . . . . . 25. *S. polaris.*

Ramuli floriferi plurifoliati; subtus folia paullo pallidiora, adulta sicca anno secundo plusminusve persistentia . . . . . 31. *S. cascadensis.*

α. Plantae prostratae ramulis repentibus; amenta coetanea vel serotina; antherae ut videtur violaceae.

Folia subtus discoloria.

Folia circumcirca dense et minute glanduloso-serata . . 64. *S. Chamissonis.*

Folia integerrima vel versus basim tantum sparse denticulata. 89. *S. fuscescens.*

Folia utrinque concoloria vel subtus paullo pallidiora et anni praeteriti plusminusve persistentia.

Ramuli floriferi saepissime 2-foliati; folia utrinque viridia, adulta sicca haud persistentia . . . . . 25. *S. polaris.*

Ramuli floriferi plurifoliati; folia subtus paullo pallidiora, adulto sicca anno secundo plusminusve persistentia . . . . . 31. *S. cascadensis.*

β. Plantae erectae rariter subprostratae sed ramis strictis nunquam repentibus.

o. Stipulae foliorum anni praeteriti pro parte persistentes; amenta praecocia sessilia.

Ramuli floriferi castanei vel purpurascentes, plus minusve nitiduli, juveniles tantum interdum tomentosi; stipulae lineares denticulatae; antherae probabiliter semper purpureae . . . . . 100. *S. pulchra.*

Ramuli floriferi plusminusve, juveniles densius subhirsuto-villosi vel villosi; stipulae lanceolatae vel cordatae, intus plusminusve glandulosae; antherae flavae.

Stipulae lanceolatae, acuminatae, saepe lobulato-denticulatae; ramuli etam vetustiores dense subhirsuto-villosi . . . . . 74. *S. Richardsonii.*

Stipulae semiovatae ad semiorbiculatae, margine dense glanduliferae (confer etiam 75. *S. calcicolam*); ramuli floriferi vetustioresque plusminusve glabrescentes vel glabri . . . . . 76. *S. Barrattiana.*

oo Stipulae nullae vel nunquam persistentes.

* Antherae juveniles distincte violaceae vel purpureae.[1]

Bracteae florum dense longe pulchre sericeae; amenta magna, 3–5 cm. longa et 1.5–1.8 cm. crassa; ramuli floriferi interdum pruinosi, praesertim annotini tomento densissimo albo obtecti . . . . . 81. *S. alaxensis.*

Bracteae florum satis breviter sericco-villosae; amenta minora vel pubescentia ramulorum diversa.

Amenta ellipsoidea vel cylindrica, 0.8–2–4 : 0.8–1 cm. magna.

Ramuli praesertim novelli tomento pseudofarinaceo floccoso-albescenti vel canescenti obtecti; amenta plus minusve ellipsoideo-cylindrica, ad 2 : 1 cm. magna, plusminusve sessilia . . . . . 82. *S. candida.*

Ramuli glabri nitiduli; amenta anguste cylindrica, ad 4:1 cm. magna, breviter pedunculata . . . . . 113. *S. arbusculoides.*

Amenta subglobosa, 5–12 : 7–8 mm. magna; ramuli breviter cano-tomentelli. 94. *S. tristis.*

** Antherae juveniles flavae (interdum partim paullo rubescentes).

= Ramuli floriferi juvenilesque plusminusve pruinosi, glabri; amenta praecocia, sessilia vel subsessilia.

Filamenta pleraque basi vel fere ad medium coalita . . . . 54. *S. irrorata.*

Filamenta libera (etiam in *S. pulchra* var. *yukonensi* et in *S. alaxensi* var. *longi-*

[1] In herbarium specimens it is often rather difficult to ascertain clearly the color of the anthers, because old anthers of other species usually become blackish in drying. Sometimes the very young anthers may be somewhat purplish, at least at the apex, while later they normally are yellow or golden. Probably the young anthers of *S. argyrocarpa*, *S. humilis*, *S. pedicellaris*, and of the very rare Californian *S. delnortensis* are more or less purpurascent too.

styli ramuli paullo vel satis pruinosi sunt). Confer 106. *S. bellam*, 104. *S. pellitam*, 102. *S. planifoliam* et 105. *S. subcoeruleam*.[1]

= = Ramuli nunquam pruinosi.

Bracteae concolores, flavescentes, partim ad apicem rubescentes; glandula linearis, quam bractea paullo brevior; amenta anguste cylindrica, sessilia vel subsessilia; species rara californica . . . . . 109. *S. Breweri.*

Bracteae bicolores, ad apicem vel omnino fuscescentes vel brunnescentes (in *S. commutata* satis flavo-brunneae); glandula vix distincte linearis, quam bractea saepissime plus quam duplo brevior.

Amenta sessilia vel subsessilia, praecocia vel subcoetanea, basi subnuda vel tantum foliolis parvis squamiformibus instructa.[2]

Pubescentia bractearum florum sericea pilis satis strictis superioribus quam bractea vix brevioribus.

Ramuli etiam novelli tantum sparse pilosi vel ab initio glabri; filamenta interdum paullo coalita.[3]

Bracteae satis late obovatae; folia superne estomatifera; stipulae saepissime nullae. (Confer etiam 96. *S. Scoulerianae* formas glabras). 79. *S. Piperi.*

Bracteae satis oblongae, obtusae vel subobtusae; folia superne stomatifera; stipulae saepissime distinctae. . . . . 66. *S. monticola.*

Ramuli praesertim hornotini tomentosi vel villoso-tomentosi; filamenta normaliter libera.

Amenta ad apicem ramulorum brevium lateralium 1–2 pseudoterminalia . . . . . 75. *S. calcicola.*

Amenta in ramulis elongatis plura lateralia.

Antherae initio (an semper?) violaceae; amenta vix ultra 2 : 1.2 cm. magna; ramuli floriferi vix plus quam 2(–2.5) mm. crassi. 93. *S. humilis.*

Antherae etiam initio semper flavae vel aureae; amenta saepissime longiora vel crassiora; ramuli floriferi plerique (2.5–) 3–4.5 mm. crassi. Confer 78. *S. Hookerianam*, 99. *S. Rowlei* et 96. *S. Scoulerianae* formas.

Pubescentia bractearum florum crispo-sericea pilis partim vel omnibus plusminusve crispis vel etiam superioribus quam bractea vix longioribus.[4]

Ramuli floriferi lutescentes vel flavescentes (saepe partim rubescentes); amenta 2–3.5(–4) cm. : 8–10 mm. magna, subsessilia, basi bracteolata vel foliis minimis 2–3 integris vel minute denticulatis suffulta; bracteae oblongae, acutiusculae, satis longe laxe sericeae . . . . 60. *S. lutea.*

Ramuli floriferi fusci, brunnescentes vel castanei, interdum pubescentes vel tomentosi.

Bracteae obovatae, apice plusminusve rotundatae obtusaeve, extus saltem dense albo-sericeae (pilis saepe satis brevibus); amenta 2–4 : 0.8–1 cm. magna (in var. *Bigelovii* ad 6:1.2 cm.), praecocia, sessilia basi bracteolis paucis minutis dense sericeis deciduis obsita. 55. *S. lasiolepis.*

Bracteae vix obovatae, oblongiores, acutiores vel glabriores vel amenta basi foliolis paucis suffulta.

[1] See the key given in this Jour. I. 69.
It is almost impossible to distinguish male specimens of these species without the aid of the leaves.

[2] It sometimes happens that species of which the aments mostly are precocious may develop a distinct peduncle with small leaves. On the other hand, species like for instance *S. glaucophylloides* or *S. pyrifolia*, not unfrequently bear rather precocious male aments with only a few small bracts at their base.

[3] See also the species mentioned above *S. bella*, *S. pellita*, *S. planifolia* and *S. subcoerulea* of which the flowering branchlets sometimes are hardly pruinose, but the filaments are always free.

[4] This refers to the species of section *Cordatae* of which the bracts sometimes are subglabrous, but mostly their hairs are somewhat curled, a feature that gives to the whole appearance of the pubescence of the aments a rather peculiar character.

Ramuli floriferi crassi distincte pubescentes vel tomentosi; amenta 4–6.5 : 1–1.3 cm. magna, sessilia, basi bracteolis paucis lanceolatis laxe pilosis minute denticulatis obsita . . . . 58. *S. missouriensis.*

Ramuli floriferi glabri vel amenta minora. Confer species sequentes: 56. *S. ligulifolia*, 56. *S. cordata*, 59. *S. mackenzieana*, 61. *S. monochroma*, 63. *S. pseudocordata*, et 62. *S. myrtillifolia.*

Amenta pedunculo distincto foliolato suffulta, coetanea vel satis serotina. (Confer etiam species Sect. *Cordatae*).

Ramuli floriferi plusminusve et praesertim novelli satis dense tomentosi vel villosi.

Foliola pedunculorum circumcirca dense minute glanduloso-serrata vel denticulata . . . . . 68. *S. adenophylla.*

Foliola pedunculorum integerrima vel tantum parce (in *S. commutata* interdum densius) denticulata.

Bracteae oblongo-lanceolatae, satis flavo-brunneae; folia utrinque concoloria et stomatifera . . . . . 69. *S. commutata*

Bracteae obovales vel obovato-oblongae, supra medium fuscae; folia subtus discoloria, superne haud stomatifera.

Pedunculi distincte foliolati, ad 2 cm. longi; foliola ut videtur semper integerrima (species rara alaskana) . . . . . 77. *S. amplifolia.*

Pedunculi submulli vel foliola parva margine plusminusve glanduloso-denticulata. Confer 65. *S. Barclayi* et 78. *S. Hookerianam.*

Ramuli floriferi (et saepissime etiam novelli) glabri.

Foliola pedunculorum circumcirca satis dense minute glanduloso-denticulata; glandula brevis, crassa, fere quadrato-globosa; bracteae satis brunneae vel apice rubescentes. . . . . 72. *S. pyrifolia.*

Foliola pedunculorum integerrima vel sparse denticulata et glandula saepissime magis elongata.

Amenta parva pedunculo excluso vix ad 1.5:0.7 cm. magna; foliola foliaque novella subtus dense adpresse sericea; antherae minimae, globosae, ? violaceae . . . . . 114. *S. argyrocarpa.*

Amenta majora; foliola foliaque plusminusve glabra vel antherae diversae.

Folia novella (et saepe matura) laxe vel densius (praesertim superne) pubescentia (Confer etiam 78b. *S. Hookerianam* var. *laurifoliam*). 65. *S. Barclayi.*

Folia etiam novella glaberrima vel citissime glabra, interdum subtus ad costam pilosula.

Bracteae satis dense sericeae; antherae distincte flavae; amenta densiflora tantum foliolis parvis plusminusve denticulatis suffulta 68. *S. glaucophylloides.*

Bracteae saepissime tantum parce sericeae; antherae (?an semper) purpureae; amenta laxiflora foliolis quam folia paullo minoribus integerrimis suffulta . . . . . 87. *S. pedicellaris*

II. CLAVIS SPECIERUM SECUNDUM SPECIMINA FEMINEA.[1]

A. Bracteae florum stramineae et sub fructi non persistentes (B, vide p. 99)

a. FLORES GLANDULIS DUOBUS (VENTRALI ET DORSALI) INSTRUCTI

Amenta serotina, pedunculis satis normaliter foliatis suffulta; folia glabra (forma rara brasiliensis) . . . . . 1c. *S. Humboldtiana* var. *Martiana*

Amenta coetanea satis breviter pedunculata; folia utrinque adpresse sericea (forma rara e Nevada et California) . . . . . 18c. *S. exigua* var. *nevadensis.*

b. FLORES NORMALITER GLANDULA UNICA VENTRALI INSTRUCTI.[2]

Amenta saepissime serotina,[3] *interdum in eodem pedunculo vel ramulo laterali*

[1] Of the Mexican species 115. *S. cana* and 98. *S. oxylepis* the female plants are still unknown.

[2] As I have pointed out in Bot. Gaz. LXV, 15 (1918) the glands of the species of Sect. *Bonplandianae* as well of some of Sect. *Pentandrae* subsect. *Lucidae* sometimes have a somewhat cup-shaped ventral gland but the dorsal gland is usually wanting.

[3] Under certain climatic conditions the aments may develop rather suddenly with

ad 2-3 apparentia; ovaria sessilia vel pedicello glandulam oblongam haud ultra duplo superante stipitata; stigmata sessilia vel styli brevissimi stigmatibus elongatis breviores; folia utrinque concoloria (*S. melanopsi excepta*), *brevipetiolata stipulae saepissime nullae* (Species sect. *Longifoliae*).

Amenta brevia satis pauciflora, etiam fructifera haud ultra 2:1, 2 cm. magna; stigmatum lobi lineares vel lineari-lanceolati; folia minima vel parva, 10–30: 1.5–3.5 mm. magna . . . . . 13. *S. taxifolia.*

Amenta longiora vel folia majora vel stigmatum lobi breves elliptici.

Stigmatum lobi lineares vel lineari-lanceolati, 4–5-plo longiores quam crassi, adulti saepissime plusminusve revoluti. (Vide clavem in Bot. Gaz. LXVII, 312). Confer species sequentes 15. *S. fluviatilis*, 16. *S. Parishiana*, 14. *S. sessilifolia* et 20a *S. longifolia* f. Wheeleri.

Stigmatum lobi lanceolati vel elliptici, satis breves, saepissime 2–3-plo longiores quam lati, adulti nunquam distincte revoluti.

Ovaria etiam juvenilia glaberrima.

Folia matura subtus plusminusve pallidiora vel glaucescentia. 19. *S. melanopsis.*

Folia subtus concoloria. Confer 18c. *S. exiguam* var. *tenerrimam*, 20b. *S. longifoliam* var. *pedicellatam* et 18c. *S. exiguam* var. *stenophyllam.*

Ovaria semper distincte sed interdum tantum pro parte sericeo-villosa vel sericea; fructus interdum fere glabrescentes. Confer 17. *S. argophyllam*, 18. *S. exiguam* et 20. *S. longifoliam.*

2. *Amenta coetanea vel interdum serotina, fructifera pedunculo saepe elongato normaliter foliato suffulta, sed semper singula; ovaria saepissime pedicello distincto (interdum glandulam ad 6-plo superante) stipitata; stigmata brevia pleraque stylo brevi sed distincto suffulta; folia dense serrato-dentata vel subtus discoloria et satis longe petiolata; stipulae saepissime satis evolutae.*

Folia foliolaque pedunculorum utrinque viridia et aequaliter stomatifera, infimis saepe exceptis linearia, lineari-lanceolata vel lanceolata, normalia satis dense glanduloso-denticulata; ramuli fragilissimi (Species sect. *Nigrae*).

Ramuli floriferi plusminusve fuscescentes vel purpurascentes; ovaria pedicellique semper glabri.

Fructus perfecte maturi ovoidei vel ovoideo-oblongi, apice vix vel tantum breviter attenuati, pedicello brevi iis plerumque 4–5plo breviore glandulam circiter duplo superante suffulti. . . . . 1. *S. Humboldtiana.*

Fructus perfecte maturi ovoideo-subrostrati, apice satis attenuati, pedicello satis variabili glandula 2–5-plo longiore suffulti . . . . . 2. *S. nigra.*

Ramuli floriferi plusminusve distincte flavescentes vel flavo-cinerei; ovaria fructusque vel tantum pedicelli saepissime villosuli; fructus ovoideo- vel anguste ellipsoideo-conici, apice subattenuati, plerique satis longe pedicellati. 3. *S. Gooddingii.*

Folia foliolaque pedunculorum subtus discoloria, plusminusve glaucescentia vel concoloria viridia sed superne haud vel sparse stomatifera et non lineari-lanceolata et ad basim laminae vel apice petioli distincte glandulifera.

Petioli etiam foliolorum pedunculorum distincte glanduliferi; ramuli floriferi plusminusve nitiduli; fructus satis breviter et crasse pedicellati vel folia subtus viridescentia; ramuli ut videtur semper valde fragiles (Species sect. *Pentandrae*, subsect. *Lucidae*).

Amenta valde serotina, brevia, vix duplo longiora quam crassa; folia subtus distincte glaucescentia, superne estomatifera; fructus 7–12 mm. longi pedicello iis circiter 5-plo breviore excluso . . . . . 5. *S. serissima.*

Amenta coetanea vel serotina, saepissime plus quam 2½–3-plo longiora quam crassa vel folia subtus concoloria vel fructus breviores.

Folia foliolaque subtus albescentia vel glaucescentia . . 6. *S. lasiandra.*

Folia foliolaque subtus concoloria, viridia.

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only a short peduncle bearing a few small leaflets. In this case a form of the *Longifoliae* may look rather like one of the *Nigrae* but the nervation and serration of the leaves and the structure of the flowers, especially of the stigmas is so different that it is impossible to confuse them.

Stomata in pagina superiore foliorum plusminusve numerosa; folia lanceolata, 4–5-plo longiora quam lata . 6c. *S. lasiandra* var. *caudata*.
Stomata in pagina superiore foliorum nulla vel sparsa; folia late ovata vel elliptico-lanceolata, (f. *angustifolia* excepta) haud ultra 3½-plo longiora quam lata . . . . . 7. *S. lucida*.

Petioli eglandulosi vel stomata in pagina superiore foliorum nulla et folia satis indistincte glanduloso-denticulata.
Ramuli floriferi plusminusve flavescentes, fragiles, non distincte rubescentes vel purpurascentes, glabri; foliola glaberrima; petioli foliorum maturorum satis tenues et longi, quam lamina vix ultra 6-plo breviores, vel folia superne stomatifera (Species sect. *Triandrae*) . . 4. *S. amygdaloides* et var. *Wrightii*.
Ramuli floriferi rubescentes vel purpurascentes vel parce pilosi; folia glabra vel satis sericea; petioli breviores vel laminae superne estomatiferae (Species sect. *Bonplandianae*).
Fructus satis parvi crassique, breviter ovoideo-conici, apice vix vel paullo attenuati, 4–5 mm. longi, pedicello satis crasso iis 4–5-plo breviore excluso vel pedicelli (basisque fructuum) pilosi.
Ramuli annotini dense tomentosi; amenta coetanea; fructus circiter 4 mm. longi, basi pedicelloque pilosi . . . . . 8. *S. jaliscana*.
Ramuli annotini glabri (interdum novelli villosuli); amenta ex axillis foliorum adultorum orientia vel coetanea; fructus circiter 5 mm. longi, glabri . . . . . 9. *S. Bonplandiana*.
Fructus 5–9 mm. longi, apice subito vel longius attenuati vel pedicello gracili iis saepe tantum duplo breviore suffulti.
Stipulae intus in facie plusminusve glanduliferae, parvae vel nullae; fructus vix ultra 6 mm. longi pedicello iis subduplo ad 3-plo breviore excluso . . . . . 10. *S. laevigata*.
Stipulae intus in facie haud glanduliferae, interdum tantum pilosae (vel in *S. Harbisonii* pauciglandulosae), saepe satis magnae; fructus 6–10 mm. longi pedicello subduplo vel duplo (rarius ad 4-plo) breviore excluso.
Ramuli tenaces; folia superne haud stomatifera . . 11. *S. longipes*
Ramuli fragiles; folia superne saltem secundum costam stomatifera 12. *S. Harbisonii*.

B. Bracteas florum (saltem ad apicem) brunnescentes, fuscae vel atrofuscae, rarius stramineae sed sub fructu persistentes.

a. Flores glandulis duobus (ventrali et dorsali) instructi.[1]

Amenta serotina, pseudoterminalia, anguste cylindrica; folia coriacea, superne conspicue inciso-reticulata, rugulosa.
Bracteae intus tantum brevipilosae; fructus vix ultra 4.5 mm. longi; petioli elongati, ad 3 cm. longi; frutex prostratus . . . . . 21. *S. reticulata*.
Bracteae utrinque plusminusve sericeo-pilosae; fructus 5–7 mm. longi; petioli breves, gemmis vix longiores; frutex prostratus vel suberectus. 22. *S. vestita*.
Amenta ovoidea vel ovoideo-cylindrica, saepe pauciflora, coetanea; folia tenuiora, minima vel superne vix vel indistincte reticulata; frutices prostrati. 24. *S. nivalis*.

b. Flores glandula una ventrali instructi

1. *Frutices humiles prostrati ramis radicantibus; amenta coetanea vel saepissime serotina; folia sub anthesi pleraque satis evoluta* (2, vide p. 101).

o Ovaria (pedicellique) etiam juvenilia glaberrima.

Folia utrinque concoloria viridia et stomatifera, minima vel parva; bracteae plusminusve concolores, flavescentes vel violascentes, vix vel parce brevipilosae.[2]

[1] A dorsal gland may occasionally be observed in the flowers of *S. brachycarpa*, *S. chlorolepis*, *S. fullertonensis*, *S. glacialis*, *S. hudsonensis*, *S. pseudolapponica* and *S. rotundifolia*. These species have bicolor bracts or distinctly lateral aments or oblong stigmas. I have not found a dorsal gland in the flowers of *S. lonchophylla*.

[2] See also *S. Peasei* which certainly is a hybrid between *S. barbata* and *S. Uva-ursi*.

Folia semper crenato-dentata, utrinque tenuiter reticulata, anni praeteriti nunquam persistentia . . . . . 27. *S. herbacea.*

Folia integerrima, adulta sicca per secundum annum vel diutius persistentia.

Nervi laterales foliorum utrinque plusminusve elevati, venulae etiam prominulae (confer etiam 29. *S. phlebophyllam* cujus fructus interdum glaberrimi sunt) . . . . . 28. *S. rotundifolia.*

Nervi laterales foliorum superne tenuissime tantum incisi, subtus prominentes sed venulae haud visibiles . . . . . 30. *S. Dodgeana.*

Folia subtus discoloria, distincte pallidiora, saepissime pruinosa.

Ovaria etiam juvenilia distincte pedicellata; pedicelli fructuum glandulam fere semper 2–3-plo superantes.

Glandula oblongo-rectangularis, 2–3-plo longior quam crassa; styli distincti, apice bifidi stigmatibus brevibus oblongis vix vel paullo longiores; pedicelli fructuum saepe bracteis subaequilongi vel longiores, 1.5–3 mm. longi. 89. *S. fuscescens.*

Glandula subquadrata, vix longior quam crassa; styli apice bifidi stigmatibus brevibus oblongis subduplo longiores; pedicelli fructuum quam bracteae plusminusve breviores . . . . . 37b. *S. arctophila* var. *lejocarpa.*

Ovaria subsessilia vel pedicelli etiam fructuum glandula plusminusve breviores vel vix longiores.

Folia (saltem ad medium et apicem) glanduloso-crenato-denticulata, superne stomatifera, adulta marcescentia partim diu persistentia; stipulae saepe distinctae; styli apice bifidi stigmatibus brevissimis bifidis 2–2½-plo longiores . . . . . 26. *S. Uva-ursi.*

Folia integerrima, rariter basim versus pauci-dentata; stipulae nunquam distinctae (confer etiam formam glabram *S. phlebophyllae* foliis adultis marcescentibus persistentibus distinctam).

Amenta 3–4-plo longiora quam crassa, 3–5 cm. longa, (saltem basi) sublaxiflora; folia majora ultra 3 cm. longa, superne non stomatifera. 34b. *S. arctica* f. *glabrata.*

Amenta etiam fructifera vix ad ½-plo longiora quam crassa, densiflora; folia etiam maxima vix ultra 2.5 cm. longa vel superne stomatifera.

Styli satis breves, stigmatibus mediocribus vix longiores; fructus maturi saepissime glaucescentes; folia matura subtus conspicue elevato-reticulata . . . . . 35. *S. ovalifolia.*

Styli elongati tenues, stigmatibus angustis longis saepe plusminusve longiores; fructus maturi vix glaucescentes; folia subtus vix conspicue reticulata . . . . . 36. *S. stolonifera.*

oo Ovaria (interdum tantum partim vel nonnisi pedicelli) plusminusve dense pilosa; fructus saepe glabriores vel subglabri.

Folia utrinque concoloria viridia vel viridi-glaucescentia, aequaliter stomatifera, sub anthesi perfecte evoluta vel adulta sicca pro parte persistentia; styli plerique distincti, saepe apice bifidi stigmatibus oblongis bifidis ad duplo longiores.

Ramuli floriferi breves tenuissimi, saepissime tantum 2-foliati; folia adulta sicca non persistentia . . . . . 25. *S. polaris.*

Ramuli floriferi saepissime plurifoliati; folia adulta sicca persistentia.

Folia glabra, utrinque laete viridia, apice saepius obtusa; fructus breviter sed satis distincte pedicellati . . . . . 29. *S. phlebophylla.*

Folia saltem novella superne pubescentia, subtus subpallidiora, apice acuta vel subacuminata; fructus plus minusve sessilia. . . . 31. *S. cascadensis.*

Folia subtus subtus discoloria, plusminusve glaucescentia, sub anthesi saepe nondum perfecte evoluta et adulta non persistentia.

Folia circumcirca satis dense minute glanduloso-serrata, obovata, fere glabra; stipulae distinctae, lanceolatae, serratae; amenta pedunculo excluso 5–6:1.5 cm. magnae (species rara alaskana) . . . . . 64. *S. Chamissonis.*

Folia integerrima vel plusminusve crenato-denticulata vel plantae aliis signis diversae.

Bracteae bicolores, apice vel pro parte maxima fuscae, versus apicem plusminusve longe sericeae, interdum apice tantum ciliatae (confer etiam *S. glacialem* speciem arcticam valde incomplete cognitam stylo subnullo a sequentibus diversam).

Stigmata linearia elongata, stylo tenui satis longo plusminusve 2–3-plo breviora; ovaria fructusque saepe ad apicem tantum pilosi.
36a. *S. stolonifera* f. *subpilosa.*

Stigmata brevia vel oblonga vel styli iis distincte breviores.

Folia subtus (in sicco) paullo pallidiora (haud distincte glaucescentia vel albescentia), leviter elevato-nervata sed vix reticulata, saepissime lanceolata vel elliptico-lanceolata, utrinque acuta vel apice obtusa, superne stomatifera, etiam maxima vix ad 4:1.8 cm. magna, fere semper integerrima; fruticulus ramulis hornotinis flavescentibus tenuibus satis brevibus . . . . . 32. *S. petrophila.*

Folia subtus distincte glaucescentia, pruinosa, superne haud stomatifera vel diversiformia vel plantae aliis signis diversae (confer clavem in Bot. Gaz. LXVII, 32).

Glandula ventralis satis brevis et lata, vix duplo altior quam crassa, apice late truncata, pedicellis fructuum duplo breviores; amenta submatura et fructifera 5–10 :1.2–1.6 cm. magna; fructus pedicello excluso 6.5–8 mm. longi; folia superne estomatifera, nitidula, saepe obsolete denticulata (confer etiam 38. *S. hudsonensem*, speciem raram incomplete cognitam) . . . . . 37. *S. arctophila.*

Glandula oblonga pleraque 2½–4-plo longiora quam crassa et pedicelli fructuum glandula breviores vel rarius sublongiores vel plantae aliis signis diversae.

Amenta fructifera ellipsoideo-globosa, circiter 1–1.5 :1.5 cm. magna; folia subcoriacea, vix ultra 1.8:1.5 cm. magna, superne estomatifera, subtus elevato-reticulata, utrinque saltem initio ut ramuli novelli villosula . . . . . 35b. *S. ovalifolia* var. *pubescens.*

Amenta fructifera cylindrica longiora; folia tenuia vel majora, subtus haud conspicue elevato-reticulata (confer etiam 89b. *S. fuscescens* var. *hebecarpum* pedicello saepe tantum piloso bracteae parvae plerumque parce pilosae subaequilongo distinctam).

Folia superne haud stomatifera; petioli 9–20 mm. longi; amenta fructifera 6:1.3 ad 9:1.8 cm. magna; fructus pedicello brevi excluso (6–)8–10 mm. longi . . . . . 34. *S. arctica.*

Folia superne stomatifera; petioli vix ad 10 mm. longi; amenta fructifera vix ad 5.5 : 1.5–1.8 cm. magna; fructus 7–8 mm. pedicello brevi excluso longi . . . . . 33. *S. anglorum.*

Bracteae concolores, stramineae vel flavescentes vel laete brunnescentes, satis brevipilosae (pilis bractea brevioribus), intus interdum glabratae. Confer formas parvas plusminusve prostratas 47. *S. cordifoliae* et species raras incomplete cognitas 39. *S. fullertonensem* et 49. *S. lingulatam.*

2. *Frutices erecti vel arbusculi, ramis nunquam repentibus et radicantibus; amenta praecocia vel coetanea; folia sub anthesi haud vel vix semievoluta.*

α Ovaria (pedicellique) etiam juvenilia glaberrima (β vide p. *103*).

* Pedicelli distincti, etiam sub anthesi[1] glandulam 2-plo usque 6-plo superantes; styli (stigmataque) breves [2]). (**, vide p. *102*).

Bracteae concolores flavescentes vel flavo-brunnescentes, in vivo interdum paullo rubescentes, in sicco saepe brunnescentes; amenta coetanea, etiam florifera pedunculo foliolato suffulta.

Foliola foliaque utrinque viridia, (saltem superne) pubescentia et stomatifera; pedicelli ad 1.8 mm. longi, glandulam vix ultra 2½-plo superantes.
69. *S. commutata.*

Foliola foliaque subtus discoloria, plusminusve glaucescentia vel folia superne glabra estomatifera et pedicelli sub fructu ultra 3 mm. longi.

[1] "Sub anthesi" refers to fully developed flowers of which the stigmas and the glands are not yet withered. Later when the fruits begin to ripen or are quite matured the size and shape of the stigmas and of the gland usually changes more or less by withering. If the flowers are too young the pedicels mostly are shorter.

[2] The styles are "short" if they are almost wanting or not longer than from 0.5 to 1 (or hardly 1.25) mm.; the stigmas may be of equal length or hardly half as long.

Petioli etiam foliolorum 5 mm. longi vel longiores; foliola foliaque circumcirca glanduloso-crenato-serrata, basi saepissime cordata; glandula brevis, suberassoir quam alta; fructus rostrati pedicello ad 4 mm. longo excluso 7–9 mm. longi . . . . . 72. *S. pyrifolia.*

Petioli etiam foliorum maturorum vix ultra 6 mm. longi; foliola foliaque integerrima, non cordata; glandula oblongo-ellipsoidea; fructus satis obtuse conici, pedicello 3.5–4.5 mm. longo excluso 6–7 mm. longi.
87. *S. pedicellaris.*

Bracteae bicolores, apice vel pro parte maxima fuscescentes; amenta florifera subsessilia (confer etiam speciem raram quebecensem 73. *S. obtusatam*).

Amenta in axillis foliorum adultorum apparentia, vix ultra 2 cm. longa; stigmata parva (species mexicanae).

Ramuli floriferi glabri . . . . . 52. *S. mexicana.*

Ramuli floriferi tomentosi.

Glandulae oblongae, pedicellis ovariorum tantum 2–2½-plo breviores; gemmae foliiferae apice plusminusve rostratae . . . . 51. *S. Hartwegii.*

Glandulae quam pedicelli ovariorum 4–5-plo breviores; gemmae foliiferae tantum acutae . . . . . 53. *S. Schaffneri.*

Amenta praecocia vel subcoetanea.

Stigmata satis crassa stylo brevi crasso subaequilonga; amenta florifera circ. 3:1 cm. magna, coetanea, basi foliolata; bracteae utrinque pilis haud crispis sericeo-lanatae, pedicellis fructuum vix ultra 2 mm. longis subduplo longiores. Species mexicana . . . . . 99. *S. Rowleei.*

Stigmata minima, stylo 0.5–1.25 mm. longo breviora vel aequilonga vel pubescentia bractearum sericeo-crispa.

Styli 1–1.25 mm. longi; amenta sub anthesi 2.5–3.5:0.9, fructifera ad 8:2 cm. (pedunculo excluso) magna; fructus 9–10 mm. longi pedicellis 2–2.5 mm. longis exclusis . . . . . 67. *S. glaucophylloides.*

Styli vix ultra 0.8 mm. longi; amenta saepissime minora et fructus breviores.

Ramuli floriferi plusminusve lutei vel flavescentes; fructus 4–5 mm. longi pedicellis 1.5–3 mm. longis exclusis . . . . . 60. *S. lutea.*

Ramuli floriferi fusci, brunnescentes vel castanei.

Bracteae distincte obovatae, apice plusminusve rotundatae, saltem extus dense (saepe breviter) albo-sericeae; amenta praecocia, sessilia, fructifera ad 6:1.3 cm. magna; fructus 5–7 mm. longi, pedicellis 2–3 mm. longis exclusis . . . . . 55. *S. lasiolepis.*

Bracteae oblongiores, subacutiores, saepe satis angustae vel laxius sericeae vel plantae aliis signis diversae.

Ramuli floriferi crassi satis pubescentes vel tomentosi; amenta fructifera 6–10:1.8 cm. magna; fructus 8–10 mm. longi pedicellis interdum fere ad 3 mm. longis exclusis . . . 58. *S. missouriensis.*

Ramuli floriferi glabri vel amenta fructusque minores.

Pedicelli fructuum 4–6 mm. longorum 2.5–4 mm. longi. Vide 59. *S. mackenzieanam* et 61. *S. monochromam.*

Pedicelli vix ad 2.3 mm. longi. Confer species sequentes: 56. *S. ligulifolia,* 52. *S. cordata,* 63. *S. pseudocordata,* et 62. *S. myrtillifolia.*

** Pedicelli nulli vel breves, etiam sub fructu glandulam haud ultra 2-plo superantes; styli (stigmataque) longitudine variabiles.

Stipulae anni praeteriti persistentes; amenta crasse cylindrica, sessilia, versus apicem ramulorum brevium 1–3 pseudoterminalia; ramuli saltem novelli dense hirsuto-villosi lanuginosive.

Stipulae lineari- ad semicordato-lanceolatae, acuminatae, glanduloso-serrato-dentatae . . . . . 74. *S. Richardsonii.*

Stipulae semicordatae ad reniformes, dense glanduliferae.

Petioli brevissimi, vix ultra 4 mm. longi; folia fere semper integerrima.
75. *S. calcicola.*

Petioli 8–15 mm. longi; folia plus minusve glanduloso-subserrata.
76b. *S. Barrattiana* var. *Tweedyi.*

Stipulae nullae vel haud persistentes; amenta saepe coetanea, pedunculata, pleraque distincte lateralia.
Ramuli floriferi saepissime pruinosi; amenta praecocia, sessilia, densiflora. 54. *S. irrorata.*
Ramuli floriferi nunquam pruinosi.
Bracteae concolores, flavescentes, stramineae vel flavo-brunnescentes, brevipilosae vel tantum breviter ciliatae; amenta parva vel minima; ovaria sessilia.
Glandula interdum etiam dorsalis adest; bracteae glabrae vel tantum ciliatae . . . . . 40. *S. chlorolepis.*
Glandula tantum unica ventralis; bracteae plusminusve utrinque brevipilosae . . . . . 41b. *S. brachycarpa var. glabellicarpa.*
Bracteae bicolores, apice vel pro parte maxima fuscescentes vel longe sericeae et amenta majora et ovaria pedicellata.
Amenta etiam florifera distincte pedunculata, basi foliolis parvis satis normalibus praedita vel pubescentia bractearum non crispa.
Folia utrinque concoloria et stomatifera, novella et saepissime etiam matura plusminusve adpresse villosa vel sericea.
Stipulae nullae vel minimae; folia integerrima; pubescentia satis argenteo-sericea; amenta etiam fructifera vix ultra 1.5 : 1 cm. magna . . . . . 50. *S. Wolfii.*
Stipulae distinctae; folia (saltem inferiora) plusminusve dense glanduloso-denticulata vel -serrata vel amenta etiam florifera majora.
Bracteae florum fere semper fuscae; pedicelli saepissime vix ad 1 mm. longi; folia circumcirca densissime glanduloso- (saepe fimbriato-) serrulata vel serrata . . . . . 68. *S. adenophylla.*
Bracteae florum satis flavo-brunneae; pedicelli saepissime 1–1.8 mm. longi; folia minimis exceptis integerrima vel saltem versus basim plusminusve brevissime glanduloso-denticulata subserratave . . . . . 69. *S. commutata.*
Folia subtus discoloria, saepius pruinosa, superne haud (vel parce) stomatifera.
Styli 2–2.5 mm. longi; amenta pedunculo 2–4-foliolato ad 2 cm. longo instructa; stipulae nullae . . . . . 77. *S. amplifolia.*
Styli 1–1.5 mm. longi; amenta brevius pedunculata vel stipulae plusminusve evolutae.
Foliola pedunculorum estipulata, saepissime squamiformia.
Ramuli novelli hornotinique (et saepe floriferi) plusminusve dense tomentosi . . . . . 78. *S. Hookeriana.*
Ramuli novelli tantum sparse pilosi, cito glaberrimi. 79. *S. Piperi.*
Foliola pedunculorum stipulata, satis normalia (confer etiam speciem alaskanam incomplete cognitam *S. Walpolei*). 65. *S. Barclayi*
Amenta etiam fructifera sessilia vel subsessilia, basi tantum foliolis minimis squamiformibus instructa vel pubescentia bractearum plusminusve distincte crispa.
Styli (1–)1.5 mm. longi; amenta fructifera densiflora; ramuli floriferi plusminusve vivide fuscescentes vel brunnescentes, saepe nitiduli. 66. *S. monticola.*
Styli 0.5–0.75 mm. longi; amenta fructifera satis laxiflora; ramuli floriferi obscure vel sordide brunnescentes, fusco-olivacei vel plusminusve pilosi . . . . . 57. *S cordata.*

β Ovaria (rariter tantum pedicelli basisve ovarii) pilosa.

* Pedicelli distincti etiam sub anthesi glandulam 2-plo usque 6-plo superantes (**, vide p. *104*).

Ramuli floriferi pruinosi . . . . . 85. *S. Geyeriana.*
Ramuli floriferi nunquam pruinosi.

Bracteae concolores, flavescentes stramineae vel flavo-brunnescentes; amenta coetanea (confer etiam speciem raram canadensem 45. *S. Maccalliana* foliis circumcirca dense crenato-dentatis distinctam).

Styli nulli vel brevissimi stigmatibus brevibus oblongis non longiores (confer etiam 92. *S. petiolarem* quae interdum bracteas satis flavo-brunneas habet).

Folia novella subtus saepissime pilis sericeis argenteis et fulvis praedita, lineari- vel anguste lanceolata; amenta etiam fructifera vix ultra 2:1.5 cm. magna; styli brevissimi; fructus 6–7 mm., pedicelli 1.8–3 mm. longi. 85c. *S. Geyeriana* var. *melcina*.

Folia nunquam fulvo-pilosa, late lanceolata, ovata vel ovato-oblonga; amenta etiam sub anthesi ad 2.5:0.8 cm. et pedicelli 3–5 mm. longi. 84. *S. Bebbiana*.

Styli distincti, stigmatibus aequilongi vel sublongiores.

Pubescentia foliolorum argenteo-sericea; ramuli floriferi glabri, fusci; fructus 4.5–5.5 mm. longi pedicello excluso . . . . . 144. *S. argyrocarpa*.

Pubescentia foliolorum ramulorumque floriferorum villoso-tomentosa; fructus circiter 7 mm. longi pedicello excluso (confer etiam 69d. *S. commutatam* var. *puberulam*) . . . . . 83. *S. cryptodonta*.

Bracteae bicolores, versus apicem vel pro parte maxima fuscescentes; amenta saepe praecocia (confer etiam 63. *S. pseudocordatam*).

Fructus vix ultra 4–5 mm. longi, ovoideo-conici, obtusiusculi, non rostrati; pedicelli vix ultra 1.5 mm. longi; amenta praecocia, etiam fructifera densiflora foliolis tantum parvis linearibus paucis suffulta; folia novella dense adpresse sericea (confer etiam speciem incomplete cognitam 91. *S. coactilem*). 90. *S. sericea*.

Fructus longiores, rostrati; amenta praecocia vel coetanea.

Amenta minima vel parva, etiam fructifera vix ad 2:1.5 cm. longa, praecocia; ramuli floriferi vix ad 2 mm. crassi, purpurascentes sed plusminusve sordide tomentelli; pedicelli ad 2 mm., fructus 7–9 mm. longi. 94. *S. tristis*.

Amenta etiam florifera majora vel plantae aliis signis diversae.

Stigmata satis elongata, 4–5-plo longiora quam crassiora, pleraque 1–1.5(–2) mm. longa, stylo saepe submullo longiora; amenta praecocia, satis crasse cylindrica, bracteis dense et longe sericeis; fructus 7–14 mm. longi pedicello 1–3.5 mm. longo excluso. Vide 95. *S. discolorem* et 96. *S. Scouleriana* et speciem mexicanam incomplete cognitam.

Stigmata brevi-oblonga, vix ultra 3-plo longiora quam crassa vel plantae aliis signis diversae.

Ramuli floriferi glabri fusci, castanei vel rubro-brunnei (sicci saepe nigrescentes), saepissime nitiduli; folia anguste lanceolata, apice sensim acuminata (confer etiam 79. *S. Piperi* foliis latioribus ovariis tantum versus apicem pubescentibus distinctam).

Amenta saepissime pedunculo distincto 2–5-foliolato suffulta, etiam fructifera densiflora; folia normalia etiam sub anthesi semievoluta utrinque stomatifera, sparse minute denticulata; petioli vix ultra 7 mm. longi . . . . . 86. *S. Lemmonii*.

Amenta saepissime subsessilia vel fructifera satis laxiflora et folia normalia sub anthesi nondum evoluta superne estomatifera, densius denticulata; petioli ad 13(–15) mm. longi . . . 92. *S. petiolaris*.

Ramuli floriferi saltem pro parte villoso-tomentelli vel obscure et sordide fuscescentes vel brunnescentes; folia plus minusve oblonga, apice obtusiora vel tantum subito brevi-acuminata; amenta saepe praecocia, etiam fructifera sessilia, densiflora; pedicelli 1.5–2 mm. longi (confer etiam 78. *S. Hookerianae* formam) . . . 93. *S. humilis*.

** Pedicelli nulli vel breves, etiam sub fructu glandulam haud ultra 2-plo superantes.

= Stipulae anni praeteriti persistentes; amenta sessilia; styli graciles elongati.

Ramuli floriferi plerique villoso-tomentosi; stipulae semicordato-lanceolatae ad lanceolatae, margine intusque dense glanduliferae . . . . 76. *S. Barrattiana*.

Ramuli floriferi glabri vel stipulae lineari-lanceolatae, intus non glanduliferae. 100. *S. pulchra.*

==Stipulae nunquam persistentes, saepe nullae. Ramuli floriferi plusminusve distincte pruinosi; amenta praecocia; folia normalia subtus dense sericea vel sericeo-velutina, saepe micantia (confer clavem in Jour. Arnold Arb. I. 69). Vide 106. *S. bellam*, 104. *S. pellitam* et 105. *S. subcoeruleam.*

Ramuli floriferi nunquam pruinosi vel folia glabra.

Bracteae florum concolores, flavescentes stramineae vel flavo-brunneae (confre etiam speciem valde incomplete cognitam 110. *S. delnortensem*).

Pubescentia versus apicem bractearum pilis sericeis bractea saepiss me subaequilongis vel sublongioribus constituta; amenta anguste cylindrica; fructus tantum 4–5.5 mm. longi; styli graciles, bifidi, circiter 1.5 mm. longi, stigmatibus parvis bifidis.[1]

Glandula lineari-ellipsoidea, interdum bracteae subaequilonga; amenta plusminusve praecocia, fructifera ad 3.5 : 1 cm. magna; fructus sessiles; folia subsessilia anguste lancolata . . . . . 109. *S. Brewerí.*

Glandula crassior vel bractea duplo brevior; amenta saepe coetanea, ad 13 : 1.3 cm. magna; fructus subsessiles; folia obovato- ad elliptico-oblonga . . . . . 112. *S. Coulteri.*

Pubescentia bractearum pilis sericeis quam bractea distincte brevioribus constituta et plantae aliis signis diversae (confer etiam clavem in Bot. Gaz. LXVII. 34).

Petioli brevissimi, plerique 1–2 mm. tantum longi, gemmas bene evolutas non superantes et stipulae petiolis aequilongae vel duplo longiores.

Frutex prostratus ramis repentibus; folia superne sparse stomatifera. 39. *S. fallertonensis.*

Frutices parvi erecti ramis saepe satis brevibus subtortuosis; folia supern estomatifera.[2]

Fructus maturi 7–8 mm. longi; styli ovariorum saepissime sessilium brevissimi, vix ad 0.5 mm. longi; ramuli hornotini densissime albo-sericeo-villosi . . . . . 42. *S. niphoclada.*

Fructus maturi vix ultra 6.5 mm. longi vel stigmata stylis aequilonga vel sublongiora vel ramuli etiam novelli minus dense griseo- vel subflavescenti-villosi . . . . . 41. *S. brachycarpa.*

Petioli gemmis vel stipulis longiores.[3]

Folia circumcirca dense glanduloso-crenato-denticulata, subtus subconcoloria, utrinque stomatifera, novella saepe ferrugineo-villosula. 45. *S. Maccalliana.*

Folia integerrima vel satis sparse denticulata, subtus discoloria (Vide 48. *S. anamesam*, 47. *S. cordifoliam*, 46. *S. glaucam* et 44. *S. pseudolapponum.*[4])

Bracteae florum bicolores, saltem ad apicem vel pro parte maxima fuscae.

Ramuli etiam floriferi plusminusve tomentelli vel villosuli; juveniles densius pilosi (confer etiam 70. *S. Eastwoodiae*, 101. *S. paraleucam*, 90. *S. sericeam* et 50. *S. Wolfii*).

Ovaria et folia subtus distincte et dense sericeo-pilosa pubescentia argenteo-micante; stigmata brevissima stylis vix ultra 1 mm. longis subtripio breviora . . . . . 111. *S sitchensis.*

Ovaria et folia subtus dense tomentosa vel floccoso-tomentosa vel villosa, stigmata oblongiora vel sublinearia.

Amenta etiam fructifera pedunculo excluso vix ultra 5:1.5 cm. magna; ovaria et folia subtus tomento denso subfloccoso vel subfarinaceo obtecta; fructus ellipsoideo-conici pedicello vix 1 mm. longo excepto 7–8 longi . . . . . 82. *S. candida.*

[1] See also 82. *S. candida* of which the flower-bracts often are rather light brown, but it is easily recognized by its dense almost floccose tomentum of the ovaries and fruits.

[2] See also 40b. *S. chlorolepis* var. *antimima* which has stomata in the upper surface of its leaves.

[3] See also 43. *S. desertorum* and 49. *S. lingulata*, two very little known arctic species.

[4] This is a difficult group of species for which I have given a key in Bot. Gaz. LXVII, p. 36–37.

Amenta etiam florifera pleraque ultra 4 cm., fructifera ad 7–13 cm. longa vel pubescentia haud floccosa vel farinacea.

Styli tantum 1–1.2 mm. longi; amenta subsessilia vel pedunculata.

Fructus 7–9 mm. longi; stipulae nullae; folia subtus satis dense tomentosa supra obscure viridia . 78c. *S. Hookeriana* var. *tomentosa*.

Fructus 6–7 mm. longi; stipulae semicordatae ad 10 mm. longae, caducae; folia subtus glabrescentia, glaucescentia, supra nitidula. 80. *S. laurentiana*.

Styli 1.2–2.5 mm. longi; amenta sessilia vel subsessilia; stipulae lineari lanceolatae; folia subtus tomento densissimo opaco molli vestita. 81. *S. alaxensis*.

Ramuli floriferi et etiam saepe novelli glabri.

Stigmata subsessilia, parva brevia, stylis brevissimis saepe bifidis aequilonga; fructus parvi, ellipsoideo-conici, satis obtusi pedicello glandulam duplo vel ultra superante excluso vix plusquam 5 mm. longi . . 90. *S. sericea*

Stigmata stylis distinctis suffulta vel oblongiora vel fructus longiores.

Amenta distincte coetanea, etiam florifera pedunculo saepissime brevi foliolato suffulta.

Folia utrinque concoloria et stomatifera, novella plusminusve dense adpresse sericea.

Fructus sessiles, vix ultra 5.5 mm. longi, laxe villosuli; styli ad 1 mm. longi stigmatibus minimis bifidis circiter triplo longioribus. 50b. *S. Wolfii* var. *idahoensis*.

Fructus brevipedicellati, 6–8 mm. longi, saepissime satis dense villosuli vel styli et stigmata longiores.

Folia minora pedunculorumque circumcirca dense glanduloso-denticulata; fructus vix ultra 6.5 mm. longi pedicello 0.5—1 mm. longo excluso . . . . . 70. *S. Eastwoodiae*.

Folia etiam minora pedunculorumque vix vel satis distanter glanduloso-denticulata; fructus 7–8.5 mm. longi pedicello ad 1.5 mm. longo excluso . . . . . 71. *S. orestera*

Folia subtus discoloria plusminusve glaucescentia, pubescentia novellorum interdum pilis fulvis mixta.

Fructus maturi ellipsoideo-conici, vix rostrati, 4.5–5.5 mm. longi; folia etiam adulta subtus tomento sericeo denso adpresso micante vel subopaco obdita . . . . . 108. *S. Jepsonii*.

Fructus maturi plusminusve rostrati, ultra 8 mm. longi folia novella subtus plusminusve sericeo-villosula vel villosa, cito glabrescentia.

Styli vix ad 1 mm. longi; foliola pedunculorum linearia vel ut normalia angustifolia, novella plusminusve fulvo-pilosa. 71. *S. orestera*.

Styli 1–2 mm. longi; foliola pedunculorum et folia plusminusve ovalia, ovato-oblonga vel ovato-lanceolata, novella tantum griseo-pilosa (confer etiam 67. *S. glaucophylloidem* quae interdum pedicellum pilosum praebet) . . . . . 65. *S. Barclayi*.

Amenta praecocia, etiam fructifera plusminusve sessilia.

Styli breves, 0.2–0.8 mm. longi, stigmatibus subbreviores; fructus 5–7.5 mm. longi, pedicello 0.5–1.25 mm. longo excluso; amenta satis anguste cylindrica, fructifera ad 6×1.2 cm. magna; folia majora anguste lanceolata, adulta glabra, novella plusminusve fulvo-sericea . . . . . 113. *S. arbusculoides*.

Styli longiores vel plantae aliis signis diversae.

Folia etima matura subtus velutino-tomentosa (species valde incomplete cognita) . . . . . 107. *S. Drummondiana*.

Folia etima novella nunquam tomentosa, matura glaberrima vel fere glabra

Ovaria tantum parce saltem ad apicem pilosa . . . 79 *S. Piperi*.

Ovaria dense sericeo-tomentosa vel villosula (confer etiam clavem in Jour. Arnold Arb. 1. 68 et 101. *S. paraleucam* speciem imperfecte cognitum).

Fructus perfecte maturi 5–6 mm. longi . . . 102. *S. planifolia*.

Fructus perfecte maturi 7–8 mm. longi . . . 103. *S. pennata*.

III.

CLAVIS SPECIERUM SECUNDUM SPECIMINA STERILIA FOLIIS MATURIS BENE EVOLUTIS INSTRUCTA[1]

A. Frutices minimi vel parvi repentes ramis radicantibus

a. Folia utrinque concoloria et stomatifera.[2]

Folia adulta sicca per secundum annum vel plures annos persistentia, saepissime marcescentia.
Forma foliorum saepissime orbicularis vel late ovalis basi apiceque rotundata, folia vix ad 11:10 mm. magna, adulta sicca anno secundo decidua. 28. *S. rotundifolia.*
Forma foliorum magis elliptica vel lanceolata vel folia longiora et adulta sicca plures annos persistentia.
Folia elliptica, obovato-oblonga vel late spathulata, apice tantum interdum rotundata, ad 15:9 mm. magna . . . . . 29. *S. phlebophylla.*
Folia lingulata, lineari- vel anguste lanceolata vel oblanceolata, apice saepissime subplicato-acuminata, ad 18:5 mm. magna, subtus plusminusve subpallidiora . . . . . 31. *S. cascadensis.*
Folia adulta sicca nunquam persistentia.
Folia margine semper crenato-serrata . . . . . 27. *S. herbacea.*
Folia margine integerrima vel in *S. polari* interdum sparse crenato-denticulata.
Pagina utraque foliorum distincte (sed saepe tenuiter) reticulata. 25. *S. polaris.*
Pagina inferior foliolorum non reticulata; nervi primarii in pagina superiore tenuissimi incisi, subtus prominentes; folia vix ultra 5–8:3–4 mm. magna. 30. *S. Dodgeana.*

b. Folia subtus discoloria, plusminusve glaucescentia,[3] saepe superne estomatifera.

Folia circumcirca satis dense minute glanduloso-serrata, obovata, fere glabra, ad 3.5 : 1.5 – 2.1 cm. magna; stipulae distinctae, lanceolatae, serratae. 63. *S. Chamissonis.*
Folia integerrima vel denticulata vel crenato-dentata vel stipulae nullae.
Pagina superior foliorum satis coriaceorum conspicue inciso-reticulata; folia margine crenulata vel integerrima (confer etiam 23. *S. leiolepidem*).
Frutex prostratus; folia cito glaberrima vel pilis paucis sericeis obsita, vix ad 5: 5.5 cm. magna; petioli elongati, ad 3 cm. longi . . 21. *S. reticulata.*
Frutex prostratus vel erectus; folia etiam adulta subtus dense sericea vel majora, oblongiora et margine plusminusve distincte crenulata vel petioli breves gemmis vix longiores . . . . . 22. *S. vestita.*
Pagina superior foliorum magis chartaceorum non conspicue (vel in *S. nivali saximontana* parce) inciso-reticulata.
Stipulae nullae (vel minimae vix ultra 1 mm. longae et citissime caducae).
Folia adulta sicca marcescentia partim diu persistentia, matura glabra, plusminusve (saltem ad medium et apicem) glanduloso-crenato-denticulata, superne nitidula et stomatifera, vix ultra 2.5 cm. longa. 26. *S. Uva-ursi.*
Folia adulta nunquam (vel in *S. nivali* interdum pauca integerrima et superne estomatifera) persistentia.
Nervi primarii (et saepissime secundarii) paginae superioris foliolorum satis incisi; folia crasse chartacea, subtus albescentia, elevato-reticulata, superne estomatifera, minima subrotunda vel ad 3.5 cm. longa et late elliptica, petiolis satis longis . . . . . 24. *S. nivalis.*
Nervi primarii paginae superioris foliorum (saltem in sicco) plus-minusve elevati; folia chartacea vel subtus vix albescentia vel superne stomatifera.

[1] This key is aimed to enable an approximate determination of the species according to sterile specimens only. In a good many cases it will not be possible to identify a specimen properly unless the flowers or fruits are at hand or it is known that it comes from a district where only a limited number of species occurs. It is extremely difficult to propose a reliable key without the help of drawings or photographs.

[2] Of *S. cascadensis* the leaves are usually somewhat paler underneath.

[3] Of *S. petrophila* the under surface of the leaves is usually not or not much paler.

Folia superne stomatifera.
Folia subtus (in sicco) paullo pallidiora, leviter elevato-nervata, sed vix reticulata; petioli 1–6 mm. longi . . . 32. *S. petrophila.*
Folia subtus distincte discoloria, plusminusve reticulata, petiolis ad 10 mm. longis (confer etiam 33. *S. anglorum*). 36. *S. stolonifera.*
Folia superne estomatifera.
Pagina inferior foliorum perfecte maturorum saepissime satis distincte elevato-reticulata; folia pleraque ovalia vel ovato-elliptica (confer etiam speciem incertam *S. glacialem*) . . 35. *S. ovalifolia.*
Pagina inferior foliorum vix elevato-reticulata; folia pleraque magis rhombeo-obovata, basim versus satis attenuata. 89. *S. fuscescens.*
Stipulae saepissime distincte evolutae (saltem in ramis vegetis).[1]
Folia superne stomatifera (confer etiam 39. *S. fallertonensem* speciem incomplete cognitam petiolis vix ad 2 mm. longis distinctam).
33. *S. anglorum.*
Folia superne estomatifera.
Petioli vix ultra 8 mm. longi; folia superne satis nitidula, normalia superiora etiam initio glaberrima, saepe (saltem partim) indistincte glanduloso-denticulata vel subcrenulata (confer etiam speciem incomplete cognitam 38. *S. hudsonensem*) . . . . . 37. *S. arctophila.*
Petioli foliorum majorum 9–25 mm. longi; folia saltem novella plusminusve sericea, pleraque integerrima . . . . . 34. *S. arctica.*

B. Frutices erecti vel arbores ramis non repentibus radicantibusve

a. FOLIA SESSILIA VEL SUBSESSILIA PETIOLIS BREVISSIMIS HAUD ULTRA 2(–3) MM. LONGIS INSTRUCTA

Stipulae adultae siccae per secundum annum persistentes; folia late ovata vel elliptico-orbicularia, basi saepe cordata, ad 6.5:4.7 cm. magna; ramuli hornotini hirsuto-lanati . . . . . 75. *S. calcicola.*
Stipulae nunquam persistentes; folia linearia ad late lanceolata.
Folia utrinque concoloria et stomatifera, linearia vel lineari-lanceolata (confer etiam 50. *S. Wolfii* speciem foliis latioribus lanceolatis vel anguste elliptico-lanceolatis distinctam).
Laminae vix ad 30:3.5 mm. magnae; stipulae saepe evolutae.
13. *S. taxifolia.*
Laminae foliorum satis evolutorum saepissime haud minus quam 5 cm. longae.
Stipulae fere semper nullae; folia integerrima vel remote tantum denticulata; petioli saepissime ultra 3 mm. longi. Vide 18. *S. exiguam* et *S. sessilifoliam* var. *Hindsianam* et var. *leucodendroidem.*
Stipulae plusminusve distinctae; folia saepe (saltem ad apicem) plusminusve distincte subspinulso-denticulata, interdum paene sessilia.
14. *S. sessilifolia.*
Folia subtus distincte discoloria, glaucescentia vel pruinosa.
Pubescentia foliorum etiam novellorum tantum grisea vel albescens.
Pagina superior foliorum stomatifera; folia adulta subtus tantum ad costam pilis sparsis praedita, lanceolata ad anguste obovalia, ad 2.2:0.6 vel 2.5 : 1.4 cm. magna; stipulae nullae; ramuli hornotini glabri.
40. *S. chlorolepis.*
Pagina superior estomatifera; folia subtus etiam in facie pilosa vel ramuli hornotini non glabri.
Basis foliorum rotundata ad subcordata vel obtuse cuneata (vix sensim attenuata); folia vix ultra 5–6-plo longiora quam lata.
Folia perfecte matura subtus satis elevato-reticulata, dense villosula vel villoso-sericeo-tomentosa, 4:0.5–1.2 ad 6:0.8–1 cm. magna; species rara californica . . . . . 109. *S. Breweri.*

[1] See also creeping forms of 47. *S. cordifolia* which has a shorter more villose pubescence especially on the upper surface of its leaves, but it is often almost impossible to distinguish certain forms of those Arctic species without the aid of flowers or fruits.

Folia etiam matura subtus vix reticulata sed elevato-nervata.

Stipulae pleraeque evolutae; ramuli hornotini densissime albo-sericeo-villosi; folia 1.5:0.5 ad 3.5:0.9–1 cm. magna; species arctica satis imperfecte cognita . . . . . 42. *S. niphoclada.*

Stipulae pleraeque nullae vel minimae; ramuli hornotini vel saepissime tantum novelli minus dense griseo- vel subflavescenti-sericeo-villosi; folia ad 2.5–3:(0.6-)1 vel 3.4:0.8 vel ad 3:1.1 cm. magna. 41. *S. brachycarpa.*

Basis foliorum acuta vel sensim attenuata; folia ad ultra 10-plo longiora quam lata; stipulae nullae vel in ramulis vegetis distinctae. 94. *S. tristis.*

Pubescentia foliorum saltem novellorum pilis ferrugineis griseisque mixta; species valde incomplete cognita mexicana . . . . . 115. *S. cana.*

b. FOLIA DISTINCTE PETIOLATA PETIOLIS 3–20 MM. LONGIS INSTRUCTA.

1. *Petioli versus apicem (vel basis laminae) glandulis distinctis saepe irregulariter lobulatis praediti; folia plusminusve dense glanduloso-denticulata serratave.*

Folia matura subtus distincte albescentia vel glaucescentia.

Laminae elliptico-lanceolatae, apice acutae, vix ultra 9:2.8 cm. magnae, superne estomatiferae . . . . . 5. *S. serissima.*

Laminae apice plusminusve acuminatae vel caudatae, ad 16:4 vel 19:2.5 cm. magnae, superne estomatiferae vel stomatibus paucis instructae. 6. *S. lasiandra.*

Folia subtus concoloria viridescentia (interdum pallide viridia sed non glaucescentia).

Laminae utrinque aequaliter stomatiferae, plusminusve lanceolatae et sensim caudato-acuminatae, pleraeque 4–5-plo longiores quam latae. 6c. *S. lasiandra* var. *caudata.*

Laminae superne haud vel sparse stomatiferae vel late ovatae, ellipticae vel elliptico-lanceolatae et semper plusminusve subito caudato-acuminatae vel haud ultra 3-plo longiores quam latae (in *f. angustifolia* 5–6-plo longiores quam latae iis *S. lasiandrae caudatae* saepe similes sed basim versus magis angustatae . . . . . 7. *S. lucida.*

2. *Petioli (vel basis laminae) eglandulosi.*[1]

α Ramuli hornotini annotinique distincte pruinosi.[2]

Folia (novella saepe excepta) glaberrima,[3] anguste lanceolata vel plusminusve oblanceolata, apice acuta, basi saepe obtuse cuneata, superne vivide viridia, estomatifera, subtus albescentia, plusminusve distanter glanduloso-denticulata, 4.5:0.9 ad ultra 10:2 cm. magna . . . . . 64. *S. irrorata.*

Folia semper (saltem subtus) tomentosa vel sericea.

Stipulae distinctae, lineari-lanceolatae, ad 22:2 mm. magnae; folia obovato- vel elliptico-oblonga vel late lanceolata, 4.5:1.5 ad 10 : 3.2 cm. (vel ultra) magna, integerrima, subtus tomento densissimo opaco albo vel flavescente molli vestita costa saepe glabrescente prominula . 81b. *S. alaxensis longistylis.*

Stipulae nullae vel parvae vel folia haud integerrima.

Pubescentia pilis adpressis sericeis argenteis fulvisque mixta; folia parva, anguste lanceolata, integerrima, utrinque acuta, 3:0.6 ad 7:1.8 cm. magna, interdum subglabrescentia sed pilis adpressis tenuissimis difficila recognoscentibus semper plusminusve obtecta vel pulchre argenteo-sericea. 85. *S. Geyeriana.*

[1] Small inconspicuous glands may be observed in *S. Bonplandiana, S. laevigata, S. longipes* and sometimes also in *S. amygdaloides.*

[2] The species of which the one year old (or older) branchlets, sometimes even the young shoots are more or less covered with a glaucous bloom are mentioned again later because the bloom may not always be present or sufficiently distinct.

[3] Of 102. *S. planifolia* the twigs are sometimes pruinose. Its leaves are lanceolate to obovate-oblong, entire or only partly denticulate and measure from 2:07 to 5:1.5–2 cm. See also 104a. *S. pellitam psilam* the leaves of which are mostly linear-lanceolate with a subrevolute and subcrenulate margin, and a very close nervation beneath.

Pubescentia argentea vel subflavescens, sericea vel tomentosa. Vide clavem in Jour. Arnold Arb. I, 69, et confer 106. *S. bellam*, 104. *S. pellitam* et 105. *S. subcoeruleam*.

β. Ramuli nunquam (vel interdum valde indistincte) pruinosi.

o Folia utrinque concoloria, viridia vel pubescentiae griseae argenteaeve causa cinereo-viridescentia.

Ramuli[1] foliaque ab initio glaberrima vel novella tantum pilosa cito glabrescentia, adulta (costa superne rarius etiam subtus interdum excepta) glabra, sed petioli saepe plusminusve dense pubescentes.

Folia linearia ad anguste lanceolata vel maxima lanceolata, semper 4-ad ultra 10-plo longiora quam lata, utrinque aequaliter stomatifera.

Laminae semper dense anguste glanduloso-crenato-dentatae vel -serratae, dentibus circiter 3–6 pro 5 mm., subtus tenuissime sed distincte angustissime reticulatae.

Ramuli annotini biennesque plusminusve rufescentes vel purpurascentes. Stipulae intus fere semper eglandulosae; petioli satis longi laminae comparati; species austro- et centrali-americana . . 1. *S. Humboldtiana*.

Stipulae intus plusminusve glanduliferae vel petioli breves (id et quam latitudo laminae haud longiores (species boreali-americana). 2. *S. nigra*.

Ramuli annotini biennesque plusminusve distincte flavescentes vel flavocinerei . . . . . 3. *S. Gooddingii*.

Laminae subintegerrimae vel satis distanter et saepe subspinuloso-serratae, dentibus 0–2 pro 5 mm.,[2] subtus satis laxe reticulatae . . 20. *S. longifolia*.

Folia elliptico- vel oblanceolata ad late elliptica vel ovato-elliptica vix ultra 4-plo longiora quam lata superne interdum parcius stomatifera.

Stipulae ut videtur semper multae; folia anguste elliptico-lanceolata vel anguste elliptico-oblonga, basi acuta vel obtusa apice subacuta vel breviter subacuminata, 1.5:0.5 ad 6.5:1.6 cm. magna, minute glanduloso-crenato-dentata dentibus 2–4 pro 5 mm.; petioli 2–8 mm. longi. 45. *S. Macoun*iana.

Stipulae pleraeque evolutae, saepe parvae, vel folia latiora, basi saepe subcordata vel subintegerrima.

Petioli vix ultra 3–4 mm. longi; folia apice obtusa vel subacuta, margine crenato-dentata vel vrenata, elliptica, elliptico-oblonga vel obovalia vix ad 5:2.5 vel 6:1.8 cm. magna. . . . . 62. *S. myrtillifolia*.

Petioli (5-)6–14 mm. longi; folia apice distincte acuta vel acuminata, margine dentata, serrata vel subintegra; magis ovato-vel elliptico-lanceolata ad 10:3.5–4 cm. magna.

Folia etiam matura satis membranacea, satis dense serrato-dentata, apice saepissime subito acuminata . . . . . 61. *S. monochroma*.

Folia crassiora, magis distanter dentata vel subintegra, apice vix, acuminata . . . . . 63. *S. pseudocordata*.

Ramuli foliaque plusminusve dense et pleraque utrinque pilosa.

Folia linearia ad anguste lanceolata, semper 4-plo ad ultra 8–10-plo longiora quam lata, utrinque aequaliter stomatifera, stipulae fere semper nullae (vide clavem in Bot. Gaz. LXVII, p. 312–316). Confer 17. *S. argophylla*m, 18. *S. exiguam*, 15. *S. fluviatilem*, 16. *S. Parishianam* et 14. *S. sessilifolia*e varietates.

Folia vix ultra 4-plo longiora quam lata, elliptica vel oblanceolata ad late elliptica vel ovato-elliptica, 76 *S. Barrattiana* excepta utrinque stomatifera; stipulae fere semper plusminusve evolutae.

Stipulae nullae vel minimae; folia normalia superiora integerrima, satis parva, vix ultra 4:1.8 cm. magna, oblanceolata, elliptico-lanceolata vel rhomboideo-oblanceolata, basi (saepe obtuse) cuneata, plusminusve adpresse argenteo-sericae . . . . . 50. *S. Wolfii*.

[1] Of 76a *S. Barrattiana Tweedyi* the youngest twigs are more or less tomentose while the leaves become almost glabrous throughout. This rare Willow is easily distinguished by its persistent conspicuously glandular stipules.

[2] See also 19. *S. melanopsis* of which the leaves are mostly somewhat glaucescent or distinctly paler beneath.

Stipulae saepe distincte evolutae vel folia majora.
Stipulae adultae siccae glabrescentes margine intusque glanduliferae, semicordatae per secundum annum persistentes; folia elliptica vel ovalia, superne, estomatifera, utrique plusminusve dense villosula, margine glandulis parvis obsita. . . . . 76. *S. Barrattiana,*
Stipulae nunquam persistentes.
Folia circumcirca dense vel densissime glanduloso- (saepe fimbriato-) serrulata vel serrata, basi plusminusve cordata . . 68. *S. adenophylla.*
Folia (minora excepta) plusminusve integerrima vel brevissime vel distanter glanduloso-denticulata subserratave, basi vix subcordata. Confer 69. *S. commutatam* et 70. *S. Eastwoodiae.*

oo Folia subtus distincte discoloria, saepissime glaucescentia, glabra vel plusminusve dense pilosa.

* Pagina inferior foliorum adultorum semper omnino pubescentia densa argenteo-sericea villosa vel tomentosa obtecta rete nervillarum saepissime haud visibili.[1]

Pubescentia foliorum ramulorumque floccoso-tomentosa vel pseudofarinacea; folia linearia vel lineari-lanceolata, superne plusminusve rugulosa, obscure viridia, subtus elevato-reticulata vel -nervata, 3.5:0.6 ad 9:1 cm. magna, stipulacea. 82. *S. candida.*

Pubescentia villoso-tomentosa vel sericea vel foliorum forma diversa.
Folia subtus tomento denso sericeo plusminusve adpresso argenteo-micante obtecta.
Laminae distincte et plusminusve dense, interdum crebre glanduloso-serratae, anguste vel late lanceolatae, basi acutae vel obtusae, apice plusminusve acuminatae, 4:1 ad 12:2.3 cm. magnae subtus tomento interdum satis tenui adpresso micante praeditae (confer etiam 91. *S. coactilem*). 90. *S. sericea.*
Laminae integerrimae vel plusminusve (saepissime indistincte) crenato-denticulatae.
Folia pleraque elliptica vel obovato-elliptica vel obovato-lanceolata vel minora oblanceolata, 4:1.3 ad 12:4.5 cm. magna, basi saepissime cuneata, apice obtusa vel subapiculata, subtus tomento denso brevi subadpresso sericeo micante obtecta; nervi laterales satis approximati et paralleli ut costa flava glabrescens elevati; stipulae pleraeque distinctae. 111. *S. sitchensis.*
Folia magis lanceolata vel anguste oblanceolata; stipulae nullae vel minimae.
Pubescentia pilis satis longis sericeis constituta, saepe laxa; folia parva, etiam maxima vix ultra 5:1.3 cm. magna; ramuli hornotini fusci, plusminusve glabri . . . . . 114. *S. argyrocarpa.*
Pubescentia pilis brevissimis constituta; folia 3.5:0.9 ad 8:2 vel 12:1.5 cm. magna; ramuli hornotini densius pilosi(confer etiam 105. *S. subcoeruleam* quae interdum ramulos haud pruinosos habet). 108. *S. Jepsonii.*
Folia subtus tomento villoso denso vel laxiore obtecta.
Pubescentia (saltem foliorum juveniliorum) pilis griseis et fulvis mixta; folia plusminusve distincte vel obscure crenata vel serrato-dentata.
Folia lanceolata vel oblanceolata, pleraque ultra 3½–4-plo longiora quam lata.[2] Confer 55. *S. lasiolepidis* formas et speciem mexicanam 51. *S. Hartwegii.*
Folia magis elliptico-lanceolata, ovata, elliptica vel obovato-oblonga, pleraque vix ultra 3(–3½)-plo longiora quam lata. Confer 95b. *S. discolorem latifoliam,* 97. *S. paradoxam* et 96. *S. Scoulerianae* formas.
Pubescentia tantum pilis griseis albisve composita; folia saepe integerrima.
Folia integerrima, subtus tomento denso albescenti obtecta, haud anguste vel lineari-lanceolata vel stipulae distinctae.

[1] If the pubescens of the mature leaves is becoming so thin that even the minute reticulation can be seen more or less clearly the species are mentioned under the next paragraph.

[2] See also forms of 93. *S. humilis* and the little known Mexican species 8. *S. jaliscana.*

Textura foliorum satis crasse chartacea; folia superne satis impresse et subtus satis elevato-nervata et reticulata, obovato-oblonga, elliptico-oblonga vel rarius elliptico-lanceolata, 5:1.5 ad 8:2.2 vel 12.5 : 3 cm. magna; petioli crassi, breves, vix ultra 6 mm. longi; stipulae non lineari-lanceolatae . . . . . 112. *S. Coulteri.*

Textura foliorum tenuiter chartacea vel folia utrinque laeviora, magis obovata vel petioli satis tenues longiores, stipulae plus-minusve lineari-lanceolatae (confer etiam speciem raram incomplete cognitam 107. *S. Drummondianam*) . . . . . 81. *S. alaxensis.*

Folia plusminusve distincte vel obscure crenulata vel crenato-dentata vel satis anguste lanceolata et stipulae nullae vel minimae.

Laminae lineari- vel late lanceolatae, pleraeque ultra 4-ad 10-plo longiores quam latae, margine valde indistincte vel haud crenulatae, saepe fere subrevolutae. Confer 106. *S. bellam* et 104. *S. pellitam.*

Laminae magis ellipticae, elliptico-oblongae, ovatae vel late oblanceolatae, vix ultra 3½-plo longiores quam latae (confer etiam speciem incomplete cognitam mexicanam 53. *S. Schaffneri*).

Stipulae pleraeque distinctae sed interdum parvae; petioli satis tenues, 3–10 mm. longi; folia rariter ultra 3(–3.5) cm. lata (confer etiam speciem incomplete cognitam 83. *S. cryptodontam*) . 84. *S. Bebbiana.*

Stipulae nullae; petioli satis crassi, 7–20 mm. longi; folia saepissime 3.5 ad 5 cm. lata . . . . . 78. *S. Hookeriana.*

* Pagina inferior foliorum adultorum plusminusve glabrescens rete nervillarum distincte visibili vel glaberrima.

† Stipulae siccae anni praeteriti per secundum annum persistentes.

Petioli 5–15 mm. longi; stipulae lineares ad semicordato-lanceolatae, margine denticulatae vel glanduloso-serrato-dentatae.

Ramuli hornotini hirsuto-tomentosi; folia obovato-elliptica vel elliptico-lanceolata vel obovato-oblonga, ad 5.5–8:3.5–6 cm. magna, margine praesertim versus basim glanduloso-denticulata . . . . . 74. *S. Richardsonii.*

Ramuli glaberrimi, nitiduli, fusci vel in var. *yukonensi* villoso-tomentosi; folia plusminusve rhomboideo-oblanceolata, obovato-oblonga vel rhomboideo-elliptica, 4:1.5 ad 6:2.5 cm. magna, saepissime integerrima . . 100. *S. pulchra.*

Petioli vix ultra 4 mm. longi; stipulae semicordatae vel reniformes, margine dense glanduliferae; folia late ovata ad orbicularia, ad 2.5:1.3 cm. magna, subtus paullo pallidiora . . . . . 75. *S. calcicola.*

†† Stipulae nunquam persistentes, nullae vel caducae.

= Laminae anguste vel late lanceolatae, saepissime ultra 4–5plo longiores quam latae. (= = see p. 113).

Folia distincte et satis dense denticulata serratave, dentibus 3–8 pro 1 mm.

Pubescentia mixta, pilis griseis fulvisque composita.

Petioli 3–7 mm. longi, villosuli; folia basim versus subintegerrima, subtus satis villosula vel minora subglabra, ad 8:1.5 cm. magna, apice acuta. 51. *S. Hartwegii.*

Petioli longiores vel folia circumcirca dense serrato-denticulata vel subtus demum ut petioli glaberrima

Folia mediocria vix ultra 8:1.5 cm. magna, adpresse tenuiter sericeavel glabra, vix distincte acuminata; petioli 6–10(–13) mm. longi, glabri. 92. *S. petiolaris.*

Folia mediocria ultra 13:2.5 cm. magna, magis anguste ovato-lanceolata, plusminusve breviter villosula et satis longe acuminata; petioli ad 20 mm. longi, pilosi, superne saepe ad basim laminae glandulis parvis obsiti. 11. *S. longipes.*

Pubescentia tantum grisea vel argentea vel nulla (in *S. arbusculoidi* interdum pilis paucis fulvis mixta).

Laminae foliorum adultorum utraque facie glaberrimae (petioli costaeque interdum parce vel dense puberulae).

Stipulae nullae vel parvae, petiolis triplo breviores.

Folia satis distanter (tantum apicem versus densius) breviter denticulata, dentibus vix ultra 3–4 pro 1 cm., anguste elliptico-lanceolata, apice breviter acuminata, basi cuneata 5:1–13:2 cm. magna; petioli apice nunquam glandulosi . . . . . 54. *S. irrorata.*

Folia circumcirca dense breviter crenato-serrata; petioli apice saepe glanduliferi.

Petioli glabri vel tantum superne in sulco pilosuli; folia ovato- vel elliptico-lanceolata, basi obtuse cuneata ad rotundata, apice longe acuminata, 6:1.2–12:2.5 cm. magna . . . . . 9. *S. Bonplandiana.*

Petioli undique pilosuli vel folia plusminusve lineari-lanceolata, ad 13:1.2 cm. magna (confer etiam 12. *S. Harbisonii*).

11b. *S. longipes* var. *venulosa.*

Stipulae distinctae.

Forma foliorum anguste oblonga, marginibus utrinque plusminusve parallelis, basi rotundata ad cordata, apice vix acuminata, folia ad 8:1.2–2 cm. magna; stipulae petiolis tantum 3–7 mm. longis sublongiores, intus haud glanduliferae . . . . . 52. *S. mexicana.*

Forma foliorum lanceolata vel anguste elliptico- vel ovato-lanceolata, basi acuta vel obtuse cuneata apice acuminata, folia ad ultra 11:2 cm. magna; stipulae petiolis ad 15 mm. longis breviores intus glanduliferae (confer etiam 11c. *S. longipes* var. *Wardii*) . . . . 10. *S. laevigata.*

Laminae foliorum etiam adultorum utraque facie vel tantum subtus pilosae.

Pubescentia sericea, adpressa, plusminusve argentea.

Folia subtus fere glabra, pilis adpressis difficile recognoscendis praedita, satis laevia, costa flavescente elevata glabra, 1.5: 0.4–9:1.8 cm. magna; petioli 4–8 mm. longi . . . . . 113. *S. arbusculoides.*

Folia subtus distinctius argenteo-pilosa, magis reticulata, costa plusminusve pilosula, ad 12:2.5 cm. magna; petioli ad 11 mm. longi.

90. *S. sericea.*

Pubescentia villosula, haud argentea.

Folia lanceolata ad ovato-oblonga, majora ultra 2.5 cm. lata vel pubescentia tantum grisea . . . . . 58. *S. missouriensis.*

Folia saepissime anguste lanceolata vel anguste ovato-lanceolata, pubescentia pilis griseis fulvisque mixta vel folia matura glaberrima.

11. *S. longipes.*

Folia integerrima vel distanter (saepe obscure et satis repando-) denticulata dentibus pro 1 cm. vix plus quam 2 vel petioli vix ultra 5 mm. longi et folia utrinque stomatifera.[1]

Petioli vix ultra 5 mm. longi; folia linearia ad lineari-lanceolata, subtus saepe paullo discoloria, glaberrima vel pilis sparsis adpressis difficile visibilibus obdita, utraque facie acqualiter stomatifera, 5:0.5 ad 13:1.2–2 cm magna.

19. *S. melanopsis.*

Petioli longiores vel folia supra medium latiora vel integerrima.

Pubescentia (saltem foliorum novellorum) pilis griseis fulvisque mixta; ramuli hornotini glaberrimi, fusci vel flavo-rubri.

Folia vix ultra 6:0.8 cm. magna, integerrima.

85c. *S. Geyeriana* var. *meleina.*

Folia ad 10:1.5–2 cm. magna, saepe plusminusve distanter denticulata.

86. *S. Lemmonii.*

Pubescentia tantum grisea vel ramuli novelli plusminusve dense tomentelli vel pilosuli; folia saepissime supra medium latiora, magis oblanceolata, ad 11:2 cm. magna, plusminusve repando-denticulata . . . . 93. *S. humilis.*

= = Laminae oblongo-ellipticae, ovatae vel ovato- vel elliptico-lanceolatae, vix ultra 3½(–4)plo longiores quam latae.

: Folia integerrima vel tantum pro parte satis distanter et saepe indistincte dentata crenatave.[2]

[1] See also such forms as 82b. *S. candida denudata* et 104a. *S. pellita psila* and such a critical species as the Arctic 43. *S. desertorum.*

[2] Leaves of more vigorous branchlets of some of these species may show a rather distinct dentation but the normal leaves are entire or slightly dentate or crenate or bear only a few distant teeth.

Stipulae etiam in ramis vegetis nullae vel pubescentia saltem foliorum juvenilium pilis ferrugineis et griseis mixta.

Pubescentia nunquam pilis ferrugineis mixta; stipulae nullae.

Folia 5–8 cm. longa, ovalia vel late obovata, apice rotundata vel obtusa; superne estomatifera; petioli pilosi; species rara alaskana. 77. *S. amplifolia.*

Folia etiam majora vix ultra 4:1.8 cm. magna, lanceolata, oblanceolata elliptico-lanceolata, anguste elliptica ad obovato-lanceolata, rarius elliptica vel oblonga, apice acuta vel subacuminata, basi cuneata ad rotundata, superne stomatifera . . . . . 44. *S. pseudolapponum.*

Pubescentia saltem foliorum juvenilium pilis fulvis vel ferrugineis mixta; stipulae nullae vel plusminusve evolutae.

Folia majora normalia ultra 5–6 ad 13 cm. longa; stipulae interdum evolutae, satis late semicordatae, pedicello duplo breviores.

Laminae satis oblanceolatae vel obovato-oblongae, supra medium latiores vel satis anguste lanceolatae, ad ultra 11:1.5–4 cm. magnae. 55. *S. lasiolepis.*

Laminae magis ellipticae vel elliptico-ovales vel elliptico-lanceolatae, ad 10:3.8 vel 13: 3.5 cm. magnae.[1] Confer species mexicanas: 98. *S. oxylepidem,* 97. *S. paradoxam* et 99. *S. Rowleei.*

Folia maxima minora, etiam in surculis vix ad 6(–6.5) cm. longa; stipulae nullae vel parvae, magis lanceolatae, cito deciduae.

Forma foliorum normalium anguste ad late obovata vel obovato-oblonga, basi plusminusve cuneata, apice subito brevissime acutata vel plicato-acuta, 4:1.8–6:3.3 vel ad 7:3 cm.; species rara . . . . 103. *S. pennata.*

Forma foliorum normalium magis lanceolata, ovato-lanceolata, oblanceolata vel elliptica.

Pagina inferior foliorum satis anguste reticulata nervillis etiam plusminusve elevatis; folia anguste lanceolata ad late oblanceolata, elliptico-lanceolata vel elliptica, apice satis obtusa, 3:0.8 ad 4.5:1.3 vel 2:1 ad 6:2 cm. magna, superne estomatifera . . . 87. *S. pedicellaris.*

Pagina inferior foliorum laevior nervis plusminusve sed nervillis haud vel vix elevatis; folia elliptica vel obovato-oblonga, ovato-lanceolata ad elliptico-lanceolata, apice acutiora, 2:0.7 ad 5:2–1.5 cm. magna, superne saepe stomatifera . . . . . 102. *S. planifolia.*

Stipulae (saltem in ramulis vegetioribus) distinctae; pubescentia etiam foliorum novellorum nunquam pilis ferrugineis fulvisve mixta.

Folia superne estomatifera. Vide clavem in Bot. Gaz. LXVII. p. 37, et confer 47. *S. cordifoliam* et 46. *S. glaucam.*

Folia superne stomatifera. Vide clavem, l.c., p. 36–37, et confer 44. *S. anamesam* et 48. *S. pseudolapponum.*

: : Folia circumcirca plusminusve dense rarius satis distanter dentata, dentato-serrata vel crenata.

Laminae longe caudato-acuminatae, anguste ad late lanceolatae vel ovato-lanceolatae, basi cuneatae ad rotundatae, margine dense glanduloso-serratae vel crenato-serratae, 6:1.5 ad 10:3 vel 15:3.5 cm. magnae, superne plusminusve stomatiferae, utrinque glabrae; petioli satis graciles, 6–20 mm. longi . . . . . 4. *S. amygdaloides.*

Laminae haud caudato-acuminatae vel basi cordatae vel petioli breviores haud glabri.

Pubescentia (saltem foliorum juvenilium) pilis griseis fulvisque mixta;[2] stipulae in ramulis vegetis distincte evolutae.

Petioli etiam foliorum majorum vix ultra 10 mm. longi; stipulae minimae petiolis 2–3-plo breviores; folia lanceolata vel elliptico-lanceolata; ramuli novelli villosuli vel tomentosuli.

Folia elliptica vel elliptico-lanceolata, basi obtusa rotundave, apice acuta vel brevi-acuminata, 5.5:2.3 ad 7:2.5 vel 8:1.7–2 cm. magna,

[1] Similar almost entire leaves may occur with 95. *S. discolor* or 96. *S. Scouleriana.* These species have a very variable foliage of which it is impossible to give here an ample description.

[2] The fulvous hairs of the pubescence are sometimes very difficult to detect or only found on young leaves (as in *S. Piperi* and some forms of *S. discolor.*)

plusminusve dense subdistincte glanduloso- serrato-denticulata; petioli undique tomentelli; species rara mexicana . 8. *S. jaliscana*.

Folia lanceolata vel oblongo-lanceolata, basi cuneata vel obtusa, apice acuta vel sensim breviter acuminata, 5.5: 1.7 ad 10:2.7 cm. magna, indistincte crenato- vel undulato- dentata; petioli superne puberuli; species rara quebecensis . . . . . 101. *S. paraleuca*.

Petioli saltem foliorum majorum longiores vel stipulae majores vel folia latiora.

Folia tantum juvenilia pilosa, adulta papyracea, subtus satis laevia, nervillis haud vel vix prominulis, elliptico-oblonga ad late elliptico-lanceolata, basi obtusa ad rotunda, apice acuta vel subito et oblique breviter acuminata, 7:3 ad 12:4–15:5 cm. magna, plusminusve irregulariter subundulato-denticulata; ramuli glaberrimi; petioli 10–20 mm. longi (confer etiam formas glabras 95. *S. discoloris* foliis subtus saepissime evidentius reticulatis) . . . . . 79. *S. Piperi*.

Folia pleraque etiam adulta plusminusve pilosa, textura crassiore vel subtus evidentius reticulata vel magis lanceolata vel oblanceolata. Confer 95. *S. discolorem* et 96. *S. Scoulerianam*.

Pubescentia nunquam pilis fulvis mixta, saepe etiam foliorum novellorum nulla (in *S. coactili* interdum pubescentia partim fulva adest).

Folia novella pellucida, balsamifera, citissime glaberrima, late ovata, elliptica vel elliptico-oblonga, basi pleraque rotundata vel subcordata, apice obtusa ad subacuminata, subtus conspicue reticulata, margine dense crenato-serrata vel crenata, 2.5–3:1.5–1.8 ad 7:3 vel 10.5 :3.5 vel 9:5 cm. magna; petioli (5–)8–25 mm. longi; stipulae nullae vel minimae; ramuli glabri, castanei, nitiduli . . . . 72. *S. pyrifolia*.

Folia novella haud balsamifera vel aliis signis diversa (confer etiam species mihi nonsatis cognitae 73. *S. obtusatam* et 88. *S. prolixam*).

Laminae apice plusminusve breviter acuminatae,[1] maximae saepissime ultra 7–9 cm. longae, ovato-vel elliptico-lanceolatae vel elliptico-oblongae, fere semper infra medium latissimae.

Ramuli annotini biennesque lutescentes vel flavescentes, partim rubescentes; folia ovato-oblonga, elliptico-lanceolata vel lanceolata, subintegra vel plusminusve obscure, rarius distinctius densius que glanduloso-serrata, superne satis flavescenti-viridia, ad 10–13.5: 2–3.5(–6) cm. magna; stipulae saepissime lunatae vel subreniformes, intus basi glandulosae . . . . . 60. *S. lutea*.

Ramuli annotini biennesque plusminusve fuscescentes, purpurascentes, castanei vel sordide brunnescentes.

Folia margine plusminusve irregulariter conspicue et argute lobulato-dentata dentibus patentibus ad 2 mm. longis, oblonga vel elliptico-lanceolata, 7:2 ad 11(–15): 2.5–3(–4) cm. magna, subtus initio dense sericeo-pubescentia, matura satis glabrescentia; stipulae lanceolatae, acuminatae, ad 8 mm. longae (species rara ex Maine) . . . . . 91. *S. coactilis*.

Folia breviter serrata vel crenato-dentata vel subintegra et signis aliis diversa.

Pagina superior foliorum vivide viridis et plusminusve nitida; folia ab initio glaberrima vel novella superne tantum in costa pilosa.

Stipulae (in surculis exceptae) nullae vel narvae, lanceolatae ad subreniformes, petiolis 2- ad pluriplo breviores; folia etiam matura subchartacea, ovato- vel elliptico-lanceolata, interdum obovato-lanceolata, basi cuneata ad cordata, 7:1.5–2.5 ad 14:6.3 cm. magna, plusminusve breviter serrata vel serrato-denticulata . . . 59. *S. mackenzieana*.

Stipulae distinctae, late semicordatae, ad 13:8 mm. magnae; folia chartacea, ovata vel ovato-elliptica, basi rotundata ad

[1] It is an extremely difficult task to characterize the differences of the leaves of the following species without the help of a series of good illustrations. I do not pretend to give more than a few hints which may lead other students to the elaboration of a more useful key.

leviter cordata, 7:3.5–9(-9.5):3.8(–4.2) vel angustiora ad 10:2.5 cm. magna, satis dense saepe crebre crenato-serrata vel -dentata . . . . . 67. *S. glaucophylloides.*

Pagina superior foliorum satis obscure viridis; folia saltem novella etiam in facie pubescentia, saepissime oblongo-lanceolata vel satis anguste lanceolata, interdum late lanceolata vel elliptico-lanceolata, serrata, ad 10:2–4 cm. magna; stipulae distinctae, reniformes ad ovatae . . . . . 57. *S. cordata.*

Laminae apice tantum acuta (rarius subito brevissime acuminatae), maximae vix ad 7 cm. longae (surculorum exceptae), vel obovato-oblongae vel obovato-ellipticae et medio vel supra medium latissimae (Confer etiam species raras paullo cognitas 80. *S. laurentianam* et 73. *S. obtusatam*).

Folia saltem matura subtus satis reticulato-nervata, pubescentia (vel glabra et vix ultra 5 cm. longa et fere integerrima), obovato-oblonga, elliptica vel obovato-elliptica, basi cuneata vel obtusa, 5:2 ad 8:3.5 vel oblongiora 5:1.5 ad 10:3 cm., minora 1.5:1 ad 3.5:1.6 cm. magna, integra vel plusminusve undulata obscure crenata vel (saltem in surculis) serrato-dentata; stipulae nullae vel minimae lanceolatae, tantum in surculis semicordatae . . 84. *S. Bebbiana.*

Folia subtus satis laevia, graciliter reticulata, glabra vel fere glabra, majora ad 7:2 vel 12:4 cm. magna, basi cuneata ad rotundata vel subcordata, distincte crenato-dentata vel- serrata; stipulae saepius distinctae. Confer 64. *S. Barclayi*, 66. *S. monticolam* et 78b. *S. Hookerianam laurifoliam.*

BERLIN-DAHLEM, *March*, 1921.

NAMES APPLIED TO AMERICAN WILLOWS BUT NOT MENTIONED IN THE PRECEDING NOTES

S. arctica a. *cordifolia* Dippel, Handb. Laubholzk. II. 311 (1892).—Syn. *S. cordifolia* Pursh.

S. arctica var. *Pallasii* f. *crassijulis* Kurtz in Bot. Jahrb. XIX. 406 (1894).

S. cordata latifolia Zabel in Beissner, Schelle and Zabel, Handb. Laubholz-Ben. 36 (1903), nomen.

S. cordata serrata Zabel, l. c. (1903).

S. cordata integra Zabel, l. c. 37 (1903), nomen.

S. cordata brevifolia Zabel, l. c. (1903), nomen.

S. cordata angustifolia Zabel, l. c. (1903).

S. cordata vestita Zabel, l. c. (1903).

S. cordata discolor Zabel, l. c. (1903), nomen.

S. cordata viridula Zabel, l. c. (1903), nomen.

S. cordata vitellina Zabel, l. c. (1903), nomen.

S. formosala Gandoger, Fl. Eur. XXI. 167 (1890).—Gandoger considers this *S. cordata* × *sericea*; see also *S. Bebbii*, p. 80.

S. humilis S. oxyriphea Gandoger, l. c. 167 (1890).

S. humilis S. brachycephala Gandoger, l. c. (1890).

S. hybrida Rafinesque in Med. Repos. N. York V. 352 (1800), nomen.

S. myrtilloides hypoglauca Ball in Can. Alpine Jour. Sp. No. 85 (1913). = *S. pedicellaris* var. *hypoglauca* Fernald.

S. Parishii Gandoger in Bull. Soc. Bot. France, LXVI. 289 (1920).

S. petiolaris S. flavinervia Gandoger, Fl. Eur. XXI. 168 (1890).

S. petiolaris S. Torreyana Gandoger, l. c. (1890).

S. Suksdorfii Gandoger in Bull. Soc. Bot. France, LXVI 289 (1920).

S. Torreyana Barratt, Sal. Am. No. 29 (1840).

S. washitana Muhlenberg apud Rafinesque, Fl. Ludov. 138 (1817), nomen.

S. wyomingensis Rydberg in Bull. Torr. Bot. Club, XXVIII. 271 (1901) = *S. Austinae* × *pseudolapponum* according to Rydberg, Fl. Rocky Mts. 198 (1917).

INDEX

TO THE SECTIONS, SPECIES, VARIETIES AND FORMS OF THE AMERICAN WILLOWS DESCRIBED OR MENTIONED IN "NOTES ON AMERICAN WILLOWS, I–XII."

Synonyms are printed in italics; new combinations published in this number in bold face type; the accepted names of sections in small capitals.

The Roman numerals refer to volumes I–III of this Journal; the names which appeared in "A Conspectus of Mexican, West Indian, Central and South American species and varieties of Salix" and in parts I–IV of the Notes published in Botanical Gazette are almost all repeated in the preceding Systematic Enumeration where reference to their place in Botanical Gazette will be found on the page indicated in this index; of a few names not mentioned again the reference to the Botanical Gazette is given preceded by "B. G."

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THE FIRST FIFTY YEARS OF THE ARNOLD ARBORETUM

C. S. SARGENT

By his will signed on the 22d of May, 1868, James Arnold, a merchant of New Bedford, Massachusetts, gave one and one-quarter of the twenty-four parts into which he divided his residuary estate "To George B. Emerson, John James Dixwell and Francis E. Parker Esqrs. of Boston *in trust:* to be by them applied for the promotion of Agricultural, or Horticultural improvements, or other Philosophical, or Philanthropic purposes at their discretion, and to provide for the continuance of this Trust hereafter to such persons, and on such conditions as they, or a majority of them, may deem proper, to carry out the intention of the donor."

The senior of these Trustees, Mr. George B. Emerson, a distinguished Boston schoolmaster, had long been interested in Natural History, especially in trees, and had prepared for the Commonwealth a report on "The Trees and Shrubs growing naturally in the Forests of Massachusetts" published in 1846 and an authoritative work on the subject still consulted by students of trees. Mr. Dixwell, the second of these Trustees, a successful Boston business man, was also a lover and student of trees, and had assembled on his place in Jamaica Plain one of the largest and best collections of native and foreign trees which was growing at this time in New England. Mr. Francis E. Parker, a Boston lawyer, was also one of the Trustees under Mr. Arnold's will. Two therefore of the three men appointed by Mr. Arnold to administer his bequest for the improvement of Agriculture or Horticulture were interested in trees and understood the importance to the world of more knowledge in regard to them than could at that time be obtained in this country; and it was natural that the idea of a scientific station for the study and cultivation of trees should have occurred to them. They fortunately realized that such an institution could be permanently and safely controlled by Harvard College.

Mr. Arnold died December 3d, 1869; and on March 29, 1872, the Trustees under his will and the President and Fellows of Harvard College signed an indenture which contained the following provisions:

"*That, Whereas*, the said James Arnold, by his last will, devised and

bequeathed to the said party of the first part one and a quarter twenty-fourth parts of the residue of his estate 'in trust, to be by them applied for the promotion of agricultural or horticultural improvements, or other philosophical or philanthropic purposes at their discretion, and to provide for the continuance of this trust hereafter to such persons, and on such conditions as they or a majority of them may deem proper to carry out the intention of the donor'; and

"*Whereas*, Benjamin Bussey, late of Roxbury, in the county of Norfolk, merchant, deceased, by his last will and testament devised to the said party of the second part an estate in remainder subject to certain life estates in the estate on which he had lived in said Roxbury, called 'Woodland Hill,' consisting of over two hundred acres of land, in trust and confidence that they would "establish there a course of instruction in practical agriculture, in useful and ornamental gardening, in botany, and in such branches of natural science as may tend to promote a knowledge of practical agriculture and the various arts subservient thereto and connected therewith, and cause such courses of lectures to be delivered there, at such seasons of the year and under such regulations as they may think best adapted to promote the ends designed, — the institution so established to be called the 'Bussey Institution'; and

"*Whereas*, the said party of the first part have agreed and determined, in the exercise of the discretion given them under the will of the said James Arnold, that the disposition of the property devised and bequeathed to them as aforesaid, in the manner and for the purposes and upon the conditions hereinafter set forth, is and will be the most suitable and proper execution of their trust, and will most effectually provide for the continuance of the trust for the future, to carry out the intention of the donor,

"*Now, Therefore*, it is agreed, bargained, and covenanted by and between the said party of the first part and the said party of the second part, as follows: —

"*First*. The said Emerson, Dixwell, and Parker, trustees, party of the first part, in consideration of the covenants, agreements, and undertakings of the said President and Fellows hereinafter set forth, do hereby give, grant, bargain, sell, convey, assign, and transfer to the said President and Fellows of Harvard College, party of the second part, and their assigns forever, the whole property and estate devised and bequeathed to them, the party of the first part, under and by virtue of the will of the said James Arnold, which has been already received or shall be hereafter received by the said party of the first part (excepting and reserving therefrom a sum sufficient to pay the actual expenses incurred by said party of the first part), a schedule of which, so far as received, is hereto annexed,—

"*To Have and to Hold* the same to the said party of the second part, and their assigns forever, in trust, with full power of sale and reinvestment, upon the trusts following, namely,

"That the said party of the second part shall hold the same as a separate

and distinct fund, and shall allow the whole net income thereof (after deducting the necessary expenses of managing the same, and also deducting, if they see fit, one third part of such net income in each year as is hereinafter provided) to accumulate and add the same to the principal, until the said fund shall amount, at a just valuation, to one hundred and fifty thousand dollars, and until the land at West Roxbury hereinafter described shall come into the possession of the said party of the second part as an estate in possession, free of all life tenancies or other encumbrances.

"*Second.* When both said events shall have happened, that the said party of the second part shall accumulate five per centum of the said net income, in every year, and add the same to the capital, as a part of the said permanent and separate trust fund.

"*Third.* That the said party of the second part shall devote the remainder of the said net income in every year to the establishment and support of an Arboretum, to be called the

Arnold Arboretum,

which shall contain, as far as is practicable, all the trees, shrubs, and herbaceous plants, either indigenous or exotic, which can be raised in the open air at the said West Roxbury, all which shall be raised or collected as fast as is practicable, and each specimen thereof shall be distinctly labelled, and to the support of a professor, to be called the Arnold Professor, who shall have the care and management of the said Arboretum, subject to the same control by the said President and Fellows to which the professors in the Bussey Institution are now subject, and who shall teach the knowledge of trees in the University which is in the charge of the said President and Fellows, and shall give such other instruction therein as may be naturally, directly, and usefully connected therewith. And as the entire fund, increased by the accumulations above named, under the best management and with the greatest economy, is barely sufficient to accomplish the proposed object, it is expressly provided that it shall not be diminished by supplementing any other object, however meritorious or kindred in its nature.

But the said President and Fellows shall be allowed to obtain from said Arboretum, free of cost, any trees, shrubs, and herbaceous plants, which, in the judgment of the Arnold Professor, can be spared from said Arboretum without injury thereto, the same to be used for the ornament of the College grounds, at Cambridge or elsewhere.

Fourth. Until the happening of both of the events named in the first clause, the said party of the second part may expend one third part of said net income in every year, and no more, in such preparation of the land hereinafter named, and in such collecting or raising of specimens, and the necessary superintendence thereof, as will promote the general and ultimate purpose above stated, but in no other way."

By this indenture Harvard College received as an Endowment for the proposed Arboretum $103,847.57 and agreed to use for it about one hundred and twenty-five acres of its Bussey estate. The land devoted at this time to the Arboretum had a frontage on Centre Street from the position of the present Centre Street entrance for about half the distance to the corner of Walter Street, on South Street from a point a short distance east of the present South Street entrance to the corner of Bussey Street, and for about three-quarters the length of the last named street. The northern boundary crossed the north meadow about where the group of Phellodendrons now stands on the right hand side of the Meadow Road, and was often covered with water from the brook from Centre Street which discharged its water on the undrained surface of the meadow. The low land near the junction of the Meadow, Forest Hills and Bussey Hill Roads, now partly occupied by the three small ponds, was an undrained swamp. Hemlock Hill was then perhaps more beautiful than it is now for since that time several old White Pine-trees which were then in their prime and rose high above the Hemlocks have died. The valley of Bussey Brook at the northern base of Hemlock Hill was then covered by an almost impenetrable thicket of Alders, and the western boundary of the proposed Arboretum crossed the brook a little west of the present grove of Red Pines. There was no access to these one hundred and twenty-five acres except by a steep cart track from the entrance to the Bussey Mansion across land controlled by the Bussey Institution.

I was appointed Director of the new Arboretum by the President and Fellows of the College on November 24, 1873. The prospect of being able to establish a useful institution would not have been encouraging if the men interested in it had had at that time as much knowledge as hope and enthusiasm. For it is safe to say that not one of them had an idea of what an Arboretum might be, or what it was going to cost in time and money to carry out the provisions of the indenture between the Trustees under Mr. Arnold's will and the President and Fellows of Harvard College; and certainly not one of them was more ignorant of the subject than the man selected to carry out the provisions of this agreement. He found himself with a worn-out farm, partly covered with natural plantations of native trees nearly ruined by excessive pasturage, to be developed into a scientific garden with less than three thousand dollars a year available for the purpose. He was without equipment or the support and encouragement of the general public which then knew nothing about an Arboretum and what it was expected to accomplish. The work of forming a nursery, however, was begun at once, greenhouses of the Bussey Institution being available for the propagation of the few plants which could at that time be found in the neighborhood of Boston.

In 1873 Mr. Frederick Law Olmsted was engaged in planning and constructing a park system for the City of Boston and suggested that that part of the Bussey farm which was to be devoted to the Arboretum might

be used with certain restrictions as one of the Boston parks. The suggestion met with little favor and was opposed by the governing Board of the College and by the Park Commissioners of Boston. The press was indifferent, and its only enthusiastic supporters were Mr. Olmsted and the Director of the Arboretum, and several years of hard semipolitical work were needed to make possible Mr. Olmsted's plan. On December 30, 1882, however, the consent of the Legislature to it having been obtained, the following agreement between the City of Boston through its Park Commission and the President and Fellows of Harvard College was signed:

"Whereas the Board of Park Commissioners of the City of Boston by virtue of the authority conferred upon said Board by chapter one hundred and eighty-five of the Acts of the Legislature of Massachusetts of the year 1875 and by the City Council of said City of Boston, by a certain written instrument of even date herewith to be recorded with the Suffolk Registry of Deeds have taken and located as and for a public park that tract of land in that part of said City known as West Roxbury held by the College and by it dedicated to the use of the Arnold Arboretum, so called, together with certain adjoining tracts, the property of other persons deemed by said Commissioners convenient and necessary for use in connection therewith for the purposes and under the powers and limitations set forth in said act and acts in addition thereto and amendment thereof — And whereas by an act of the General Court of Massachusetts passed on the twenty-ninth day of March in the year 1880 it was enacted that in case the said Board of Park Commissioners deemed it desirable so to take the said lands for the said purposes the City was thereby authorized to lease such portion of the said Arboretum and adjoining tracts so taken as the said Board of Commissioners might deem not necessary for use as parkways and grounds to the College to be held to the same uses and purposes as the said Arboretum was then held under the trusts created by the wills of Benjamin Bussey and of James Arnold and for such a term and upon such mutual restrictions, reservations, covenants and conditions as to the use thereof by the public in connection with the uses of the same under the said trusts, and as to the rights, duties and obligations of the contracting parties as might be agreed upon between the said Commissioners and the College. And the Board of Park Commissioners on the part of the City and the President on behalf of the College were respectively authorized to execute and deliver the said lease. And whereas the said Board of Park Commissioners deems such portion of the said Arboretum and adjoining tracts as is hereinafter described and leased to be not necessary for use as parkways and grounds and considers that the same will be better and more advantageously enjoyed and used by the public as a part of the said park if the same be leased to the College for the purposes of the said trusts and upon such terms and subject to such provisions with regard to the use thereof by the public as are hereinafter contained. And it has been agreed between the said Commissioners and the College that the same be

leased to the College for the term and upon the mutual restrictions, reservations, covenants and conditions hereinafter expressed.

"Now this Indenture witnesseth that the City by virtue and in exercise of the power and authority given to it by the said Act and of every other power and authority it hereto enabling doth demise and lease unto the College all that parcel of land delineated on a plan entitled 'The Arnold Arboretum' and to be recorded herewith in the Suffolk Registry of Deeds situate in that part of Boston known as West Roxbury and bounded and described as follows:—

* * * * * * * * * * * * * *

"Excepting and always reserving out of these presents all those parts of the said lands delineated and marked on the said plan as driveways and parkways and those parts of the same lands delineated and marked A and B respectively on the said plan. And granting with the premises hereby leased a free and unobstructed right of way upon and over all the said excepted parts of the said lands and upon and over the driveways and parkways delineated on the said plan and so marked thereon.

"To have and to hold the premises hereby leased (hereinafter called the Arnold Arboretum) unto the College and its successors and assigns for the term of One thousand years from the date hereof without impeachment of waste upon and for the same trusts, uses and purposes as those upon and for which the said land held by the College for the purposes of the said Arboretum at the said time of the passing of the said Act of the year 1880 was then held under the will of Benjamin Bussey and the will of James Arnold and a certain indenture dated the 29th day of March in the year 1872 and made between George B. Emerson, John J. Dixwell and Francis E. Parker as Trustees of the will of the said James Arnold of the one part and the College of the other part in which indenture the trusts provided for in the said will of James Arnold are declared in pursuance of the directions in the said will contained. Yielding and paying therefor during the said term the yearly rent of one dollar — And the City covenants with the College and its successors and assigns that the College and its successors and assigns shall peaceably hold and enjoy the premises hereby leased during the said term without any interference or control of the City or any person claiming through or under it. That the City will at all times save and keep harmless and indemnified the College and its successors and assigns and keep the premises hereby leased free and discharged of and from all taxes and assessments of every description which during the said term may be assessed or payable in respect of or charged upon the premises hereby leased or any part thereof. That the City will within a reasonable time make and finish fit for use of good sound materials and in a proper and workmanlike manner the driveways of which the sites and dimensions are delineated on the said plan and so marked thereon but at a cost not exceeding seventy-five thousand dollars, and that the said driveways during the said term shall be repaired and maintained in a

proper and substantial manner free of all charge and expense to the College and its successors and assigns. That the City will during the said term provide and maintain a proper and sufficient police in and about the Arnold Arboretum and the said parts excepted from these presents and the said roads, avenues, and parkways for the preservation of order and good conduct and the observance of the rules hereinafter mentioned or provided for. That no public street or highway and no steam or horse railway or construction for like purposes shall be laid out through or over any part of the Arnold Arboretum except in such places, if any, and in such manner as the Park Commissioners and the College shall approve. That if the water supply from the sources within the Arnold Arboretum which the College has heretofore enjoyed for use in the said Arboretum shall at any time be cut off, interrupted or impaired by the City or its assigns the City will immediately provide at its own charge and expense an equal or superior supply of water for the like use. And that if the College, its successors or assigns shall be desirous of taking a renewed lease of the said premises for the further term of One thousand years from the expiration of the term hereby granted the City or its assigns will upon the request and at the expense of the College, its successors or assigns and upon its or their executing and delivering to the City or its assigns a counterpart thereof forthwith execute and deliver to the College, its successors or assigns a renewed lease of the said premises for the further term of One thousand years at the same yearly rent and upon and subject to the same restrictions, reservations, covenants, and conditions as are herein contained including this present covenant and so on from time to time forever. And the College for itself and its successors and assigns covenants with the City that the College will not commence or prosecute any action, suit or other proceeding against the City for the enforcement or recovery of any damages or claim which the College may have or be entitled to against the City by reason of the said taking of the said Arboretum land by the City. And that the Arnold Arboretum shall at all reasonable times be open to the inspection of the public as a part of the said Park subject to the rules hereinafter mentioned or provided for. Provided, Always, and it is hereby declared that the City shall be at liberty to erect and maintain suitable gateways for entrance thereto upon any of the said excepted parts and to maintain gates there. And that no pavilion, kiosk, urinal, museum, greenhouse, stable, shed, or other building (except as above provided) shall be erected or maintained within the Arnold Arboretum or in any of the said excepted parts or in any of the said driveways or parkways without the prior consent of the Park Commissioners and the College. Provided, also, and it is hereby declared and agreed that the use of the Arnold Arboretum and of the said excepted parts and of the said roads, avenues and parkways by the City and its assigns and the College, its successors and assigns and the public shall be subject to the rules contained in the schedule hereto annexed and to

such additional rules as have been or may from time to time be agreed upon between the Park Commissioners and the College. But any of the said rules may be altered or annulled by agreement between the Park Commissioners and the College."

By this agreement the location of the Arboretum was practically fixed for at least one thousand years, for although the College may in the future wish to move it to less valuable land it is not possible to conceive that the City of Boston will ever consent to abandon the benefit it derives from the use of the Arboretum as a public park. By this agreement the Arboretum is relieved of the danger of taxation during the period of the lease and obtains without expense the protection of the Boston police. In return for these benefits the public is admitted to the free enjoyment of a public garden maintained with the exception of the roads by the University. By this arrangement more than two-thirds of the north meadow with the land on which the Administration Building now stands and the hill behind it was added to the original area of the Arboretum, which also gained an entrance from Walter Street and that part of the valley of the Bussey Brook between Walter Street and the western boundary of the Bussey Farm. In return the Arboretum gave up to the City the land now occupied by the Arborway between the old northern boundary of the north meadow and the Forest Hills entrance and the wooded slope east of the Arborway.

A few trees along the boundaries had been planted before 1882, but the City was slow in building the roads with their adjoining gravel paths, and it was not possible to begin planting trees in systematic arrangement until 1885, that is at the end of thirteen years devoted to preliminary negotiations and the perfection of plans.

It was soon found that the area which in 1882 was devoted to the Arboretum was inadequate for the purpose, and that if even a small part of the trees and shrubs which the College had arranged with Mr. Arnold's Trustees was to be found in it more land was needed for the purpose. Two estates on Centre Street with an area of about eight acres between the original western boundary of the Bussey Farm at this point and Walter Street were bought by the City for the Arboretum and the buildings were removed from them. In 1894 the President and Fellows of the College transferred their property west of Bussey Street, with an area of seventy-five acres and known as Peter's Hill, to the Arboretum. The arrangement made in 1882 with the City of Boston for the ownership and control of the original Arboretum was extended to the Peter's Hill addition. In 1904 a few friends of the Arboretum bought for it a house and about four thousand feet of land on Centre Street between Prince and Orchard Streets, Jamaica Plain, near the entrance of that name. The house is used as the home for the superintendent, and the grounds attached to it as a nursery. For many years the propagation of plants for the Arboretum had been carried on on a small piece of ground near

the Centre Street entrance, leased from the Trustees of the Adams Nervine Asylum for the purpose, and to take the place of these inadequate accommodations a modern greenhouse with cold pits and frames was built in 1917 on the Centre Street land for a new propagating plant. In 1919 the land of the Bussey Institution between South Street and the location of the Dedham Branch of the N. Y. N. H. & H. R. R.with an area of sixteen acres was bought for it by friends of the Arboretum from the College; and in 1922 the hill surrounded by property belonging to the Park Department of Boston, and by Centre and Walter Streets and an unnamed road connecting these streets, with an area of fourteen acres, has also been bought by friends of the Arboretum and presented to it. The persent area of the Arboretum is now therefore approximately two hundred and fifty acres.

NATURAL FEATURES

Meadows, hills and valleys are found within the boundaries of the Arboretum. The ground rises gradually from the great meadow at its north end to the summit of Bussey Hill from which views of the Blue Hills to the south and of Cambridge and Boston are obtained. From the top of Bussey Hill the ground drops abruptly to South Street on the south and to the west and southwest to the valley which extends from Centre to South Streets, and which at the northern base of the second of the Arboretum hills, Hemlock Hill, is joined nearly at right angles by the valley through which Bussey Brook flows from the northwest and enters the Arboretum under Walter Street. Through the valley which separates the western base of Hemlock Hill from the third and highest of the Arboretum hills, Peter's Hill, Bussey Street, a highway open to traffic, extends from Walter Street at a point near the Walter Street entrance to the Arboretum to South Street, and separates Peter's Hill from the rest of the Arboretum. The land acquired in 1919 between South Street and the railroad drops abruptly at its eastern end from the southern base of Bussey Hill to a broad low peat meadow through which a new channel for the Bussey Brook has been made; west of this low meadow only a narrow strip of higher land separates South Street from the railroad. A hill sloping to the north and east on Centre Street and separated by a low depression from the base of a slope descending from Walter Street and facing the north is the feature of the latest addition to the Arboretum area.

The great natural feature of the Arboretum is Hemlock Hill with its high steep cliffs rising on the north from the Bussey Brook and covered so thickly with Hemlock trees that the rays of the sun rarely penetrate to the ground between them. In no other public garden are there such cliffs or a more beautiful remnant of a coniferous forest. Oaks and other native deciduous leaved trees from one hundred to perhaps two hundred years old still cover small areas on each side of the Meadow Road,

on Centre Street, and on Bussey Street at the eastern base of Peter's Hill, and are valuable in showing several important New England trees in their adult state.

ARRANGEMENT OF THE LIVING PLANTS

The trees which have been planted are arranged in botanical sequence in family groups, the genera of each family and the species of each genus being placed together, the arrangement beginning with the Magnolia Family at the Jamaica Plain Gate and ending with the Pinaceae at the Walter Street Gate.

That they may show their habit under different conditions several individuals of important North American species have been planted close together in groups, and at a distance from the group an individual of the species is planted with sufficient space about it to insure a full development of branches. A representative of almost every genus stands near a drive so that visitors passing along the Arboretum roads and gravel paths can obtain an idea of the genera of trees hardy in Massachusetts and of their relation to each other. An attempt has been made to place the Family groups in positions where the trees may find favorable conditions for growth without interfering with the beauty of hills and valleys, and of the natural woods. Access to the different groups of all the trees is secured by grass-covered paths several miles in length which reach every part of the Arboretum and make easy the examination of the trees. Hardy shrubs of genera in which there are not species which are trees are arranged in the same sequence as the trees in parallel beds ten feet wide with a total length of 7765 feet, and separated by grass-covered paths. This shrub collection is situated on the level ground near the Forest Hills entrance and is surrounded by a trellis on which are grown vines and other climbing plants. It has been established for the instruction of gardeners, landscape gardeners and others interested in shrubs who can find in it all the perfectly hardy species of many genera conveniently arranged for comparative study. Insufficient space in the area devoted to this shrub collection has made it necessary to arrange the shrubs belonging to genera in which some of the species are trees in groups as near as possible to the trees of the same genus or Family; as, for example, the Spindle-trees (Evonymus) and the Sumachs (Rhus) on opposite sides of the Meadow Road, the Lilacs below the Ash-trees on the left hand side of the Bussey Road, the Viburnums near the junction of the Bussey and Valley Roads, and the Kalmias and Rhododendrons at the base of Hemlock Hill. Large numbers of shrubs have also been planted to form margins to the roads and an undergrowth among the groups of trees, native shrubs having been chiefly used for this purpose in order to preserve as far as possible a New England character. Peter's Hill has been used for an extension of the Pinetum, for the principal collection of Hawthorns which occupies its eastern slope, for a large supplementary collection of Crabapples and species

of Pear-trees, and the collection of Poplars and Alders; below the top of the hill and near the western boundary of the Arboretum is a large mixed plantation of deciduous-leaved trees in which are found some of the rarest and most interesting species in the whole collection, for this exposed hilltop has proved favorable to the growth of several trees which have not flourished in the Arboretum at lower levels. The land between South Street and the railroad will be used for new and enlarged collections of Poplars and Willows, and the addition between Centre and Walter will be chiefly planted with trees which require deep soil and good drainage to enable them to grow to a large size and live to old age.

The regions represented by the living collections are the cool temperate and colder parts of North America, Europe and Asia, including the higher altitudes of the Himalayas and other more southern mountains. No plants from the southern hemisphere, not even from the high Andes, southern Chile or the higher mountains of New Zealand have proved hardy in the Arboretum. It is believed that there are now growing in the Arboretum between five and six thousand species and varieties of trees and shrubs which belong to the following Families and Genera:

GYMNOSPERMAE

Ginkgoaceae
Ginkgo

Taxaceae
Cephalotaxus
Taxus
Torreya

Pinaceae
Abies
Cedrus
Chamaecyparis
Cryptomeria
Cupressus
Larix
Libocedrus
Picea
Pinus
Pseudolarix
Pseudotsuga
Sciadopitys
Taxodium
Thuja
Tsuga

Gnetaceae
Ephedra

ANGIOSPERMAE
MONOCOTYLEDONEAE

Gramineae
Arundinaria
Phyllostachys
Sasa

Liliaceae
Smilax
Yucca

DICOTYLEDONEAE

Salicaceae
Populus
Salix

Myricaceae
Comptonia
Myrica

Leitneriaceae
Leitneria

Juglandaceae
Carya
Juglans
Platycarya
Pterocarya

Betulaceae
Alnus
Betula
Carpinus
Corylus
Ostrya
Ostryopsis

Fagaceae
Castanea
Fagus
Quercus

Ulmaceae
Celtis
Hemiptelea
Pteroceltis
Ulmus
Zelkova

Moraceae
Maclura
Morus

Aristolochiaceae
Aristolochia

Polygonaceae
Atraphaxis

Chenopodiaceae
Atriplex
Eurotia

Trochodendraceae
Euptelea

Cercidiphyllaceae
Cercidiphyllum

Ranunculaceae
Clematis
Paeonia
Zanthorrhiza

Lardizabalaceae
Akebia
Decaisnea
Sargentodoxa

Berberidaceae
Berberis
×Mahoberberis
Mahonia

Menispermaceae
Cocculus
Menispermum
Sinomenium

Magnoliaceae
Liriodendron
Magnolia
Schisandra

Calycanthaceae
Calycanthus

Anonaceae
Asimina

Lauraceae
Benzoin
Sassafras

Cruciferae
Aethionema
Alyssum
Iberis

Saxifragaceae
Decumaria
Deutzia
Fendlera
Hydrangea
Itea
Jamesia
Philadelphus
Ribes
Schizophragma
Whipplea

Hamamelidaceae
Corylopsis
Fortunearia
Fothergilla
Hamamelis

Liquidambar
Parrotia
Parrotiopsis
Sinowilsonia

Eucommiaceae

Eucommia

Platanaceae

Platanus

Rosaceae

Amelanchier
Cercocarpus
Chaenomeles
Chamaebatiaria
Cotoneaster
×Crataegomespilus
Crataegus
Cydonia
Dryas
Exochorda
Holodiscus
Kerria
Maddenia
Malus
Mespilus
Neillia
Neviusa
Osmaronia
Pentactina
Peraphyllum
Petrophytum
Photinia
Physocarpus
Potentilla
Prinsepia
Prunus
Pyracantha
Pyrus
Rhodotypus
Rosa
Rubus
Sibiraea
Sorbaria
×Sorbaronia
×Sorbopyrus
Sorbus
Spiraea
Stephanandra
Stranvaesia

Leguminosae

Amorpha
Calophaca
Campylotropis
Caragana
Cercis
Cladrastis
Colutea
Coronilla
Cytisus
Desmodium
Genista
Gleditsia
Gymnocladus
Halimodendron
Hedysarum
Indigofera
×Laburnocytisus
Laburnum
Lespedeza
Maackia
Petteria
Robinia
Sophora
Ulex
Wistaria

Rutaceae

Evodia
Orixa
Phellodendron
Poncirus
Ptelea
Ruta
Zanthoxylum

Simarubaceae

Ailanthus
Picrasma

Meliaceae

Cedrela

Polygalaceae
Polygala

Euphorbiaceae
Andrachne
Daphniphyllum
Securinega

Buxaceae
Buxus
Pachysandra
Sarcococca

Empetraceae
Corema
Empetrum

Coriariaceae
Coriaria

Anarcardiaceae
Cotinus
Rhus

Aquifoliaceae
Ilex
Nemopanthes

Celastraceae
Celastrus
Evonymus
Pachystima
Tripterygium

Staphyleaceae
Staphylea

Aceraceae
Acer

Hippocastanaceae
Aesculus

Sapindaceae
Koelreuteria
Sapindus
Xanthoceras

Sabiaceae
Meliosma
Sabia

Rhamnaceae
Berchemia
Ceanothus
Hovenia
Paliurus
Rhamnella
Rhamnus
Sageretia
Zizyphus

Vitaceae
Ampelopsis
Cissus
Columella
Parthenocissus
Vitis

Tiliaceae
Grewia
Tilia

Malvaceae
Hibiscus
Sphaeralcea

Dilleniaceae
Actinidia

Theaceae
Gordonia
Stewartia

Guttiferae
Hypericum

Tamaricaceae
Myricaria
Tamarix

Cistaceae
Helianthemum
Hudsonia

Stachyuraceae
Stachyurus

Cactaceae
Opuntia

Thymelaeaceae
Daphne
Direa
Wikstroemia

Elaeagnaceae
Elaeagnus
Hippophae
Shepherdia

Lythraceae
Decodon

Nyssaceae
Davidia
Nyssa

Araliaceae
Acanthopanax
Aralia
Echinopanax
Hedera

Cornaceae
Cornus
Helwingia

Clethraceae
Clethra

Pyrolaceae
Chimaphila

Ericaceae
Andromeda
Arctostaphylus
Arctous
Bruckenthalia
Calluna
Cassiope
Chamaedaphne
Chiogenes
Daboecia
Enkianthus
Epigaea
Erica
Gaultheria
Gaylussacia
Kalmia
Ledum
Leiophyllum
Leucothoe
Loiseleuria
Lyonia
Menziesia
Oxydendron
Phyllodoce
Pieris
Rhododendron
Tripetaleia
Tsusiophyllum
Vaccinium
Zenobia

Sapotaceae
Bumelia

Ebenaceae
Diospyros

Styracaceae
Halesia
Pterostyrax
Styrax

Symplocaceae
Symplocos

Oleaceae
Chionanthus
Fontanesia
Forestiera
Forsythia
Fraxinus
Jasminum
Ligustrum
Syringa

Loganiaceae
Buddleia

Apocynaceae
Vinca

Asclepiadaceae
Marsdenia
Periploca

Boraginaceae
Ehretia

Verbenaceae
Callicarpa
Caryopteris
Clerodendron
Vitex

Labiatae
Elsholtzia
Hyssopus
Lavandula
Perowskia
Teucrium
Thymus

Solanaceae
Lycium
Solanum

Scrophulariaceae
Paulownia
Pentstemon
Veronica

Bignoniaceae
Anisostichus
Bignonia
Catalpa

Rubiaceae
Cephalanthus
Leptodermis
Mitchella

Caprifoliaceae
Abelia
Diervilla
Dipelta
Kolkwitzia
Linnaea
Lonicera
Sambucus
Symphoricarpus
Viburnum

Compositae
Artemisia
Baccharis
Chrysanthemum
Pertya

RECORDS AND LABELS

As far as it has been possible to do it the record of every species and variety of the trees and shrubs planted in the Arboretum has been kept in a card catalogue and to each has been given a number. The exact position of each tree in the systematically arranged groups is designated on the sheets of a large-scale map and with them is kept the detailed history of each tree in the hope that it will be possible for a stranger to locate every tree in the collection even if the labels are lost.

To a branch of every important plant in the Arboretum is attached a small metal label on which the name, origin and card catalogue number of the plant is stamped with raised letters. These labels are to preserve records and not for public use. For the instruction of visitors zinc labels six inches long and four inches wide painted brown with their Latin and English names and their native country in black letters are fastened with copper nails to the trunks of large trees at about the height of the eye. Small trees and large shrubs are furnished with oblong wooden labels about eight inches long painted white with black letters and hung from a branch in a conspicuous position; metal labels of about the same size as the trunk labels and raised a few inches above the surface of the ground are placed before the plants in the general shrub collection.

THE INTRODUCTION OF NEW PLANTS

In 1872 when Harvard College agreed to obtain as far as practicable for the Arnold Arboretum all the trees, shrubs and other plants which could be grown in West Roxbury very few such plants could be found in any private or commercial collection in the United States, and a large number of them were still unknown either in this country or in a living state in

Europe; and for more than forty years continuous efforts have been made to make it possible for Harvard to make good in its contract with Mr. Arnold's Trustees. Some progress has been made but there are still regions of the northern hemisphere to explore, and trees still unknown in Massachusetts to be brought here.

At once after his appointment the Director began to obtain plants and seeds from European botanical and horticultural establishments; and in December 1878 the Arboretum received from William S. Clark, first President of the Agricultural College at Sapporo in Japan, its first direct consignment of seeds from eastern Asia.

The first opportunity to obtain on a large scale for the Arboretum American plants not then in cultivation in the United States came in 1877 when the Director was asked to prepare for the General Government a report on the forests and forest wealth of the country. In the preparation of this report he was obliged to travel into all the forest regions of the country and to select as assistants the men living in different parts of the United States best equipped with knowledge of trees and forests. Among these assistants the Arboretum found friends who continued to help it during the remainder of their lives and to keep it in constant communication with all parts of the United States.

During the last forty years the Arboretum has lost no opportunity to increase the number of species of plants cultivated in the United States and Europe. Its officers and agents have continued to explore the forests of North America; they have visited every country in Europe, the Caucasus, eastern Siberia and Korea, and have studied every species of tree growing in the forests of the Japanese Empire from Saghalin to the mountains of Formosa. The most successful of all plant collectors, Mr. E. H. Wilson, now Assistant Director of the Arboretum, has gathered for it seeds and other material of the trees and shrubs and of the Lilies that grow in great variety on the mountains which rise from western China to the Tibetan Plateau. Agents of the Arboretum in pursuit of knowledge and material have visited the Malay Peninsula, Java, the Himalayas, the high mountains of east tropical Africa, southern Africa, Australia, Mexico, Peru, Chile southward to Terra del Fuego, and the Falkland Islands. One of the results of these journeys of the last forty years is the introduction into the United States of the plants named in the following list. Those which are preceded by a cross are hybrids, and those preceded by an asterisk are believed to have been first introduced into cultivation by the agency of the Arboretum.

*Abelia Engleriana; *A. Graebneriana; *A. longituba; *A. parvifolia; *A. Schumannii; *A. Zanderi.

*Abies chensiensis; A. concolor; A. Delavayi; A. Fargesii; *A. Faxoniana; A. grandis (hardy form from Idaho); *A. holophylla; A. homolepis var. umbellata; A. koreana; A. lasiocarpa var. Beissneri; *A. recurvata; A. sachalinensis; *A. sachalinensis var. Mayriana; *A. sachalinensis var.

nemorensis; A. sibirica var. nephrolepis; *A. sibirica var. nephrolepis f. chlorocarpa; A. spectabilis var. brevifolia; *A. squamata; *A. sutchuenensis; *A. Veitchii var. olivacea.

*Acanthopanax Giraldii; A. Henryi; A. innovans; *A. lasiogyne; A. leucorrhizus; *A. leucorrhizus var. fulvescens; *A. leucorrhizus var. scaberulus; A. ricinifolius; A. sciadophylloides; A. sessiliflorum var. parviceps; A. setchuenensis; A. Simonii; A. ternatus.

Acer barbinerve; A. barbinerve var. glabrescens; A. Buergerianum; A. Buergerianum var. trinerve; A. campestre var. hebecarpum; A. campestre var. nanum; *A capillipes; A. cappadocicum f. tricaudatum; A. carpinifolium; *A. catalpifolium; A. caudatum; A. caudatum var. multiserratum; *A. caudatum var. Prattii; A. caudatum var. ukurunduense; A. cissifolium; A. crataegifolium; A. Davidii; A. diabolicum var. purpurascens; A. discolor; A. distylum; A. Durettii; A. Fargesii; A. flabellatum; A. Franchetii; A. ginnala; A. ginnala var. aidzuense; A. ginnala var. Semenowii; A. grandidentatum; A. griseum; A. Heldreichii; A. Heldreichii var. macropterum; A. Henryi; *A. Hersii; *A. laxiflorum; A. longipes; A. mandshuricum; *A. Maximowiczii; A. Mayrii; A. micranthum; *A. Miyabei; *A. morrisonense; A. nikoense; A. Negundo (dwarf form); *A. nudicarpum; *A. Okamotoanum; A. opalus; A. opalus var. tomentosum; A. parviflorum; A. pennsylvanicum var. erythrocladum; A. pictum; A. pictum var. parviflorum; A. pictum var. tricuspe; *A. pilosum; A. platanoides var. acuminatum; A. Pseudo-Platanus var. erythrocarpum; A. pseudo-sieboldianum; A. pseudo-sieboldianum var. ambiguum; *A. pycnanthum; A. robustum; A. rufinerve; A. saccharinum (dwarf form); *A. saccharum var. Schneckii; A. Sieboldianum; A. sinense; A. tegmentosum; A. tetramerum; A. tetramerum var. betulifolium f. latialatum; *A. tetramerum var. elobulatum f. longeracemosum; A. tetramerum var. tiliifolium; A. Trautvetteri; *A. triflorum; A. truncatum; *A. Tschonoskii; *A. Tschonoskii var. rubripes; A. zoeschense; A. zoeschense var. elongatum.

Actinidia callosa var. Henryi; A. chinensis; *A. coriacea; A. Henryi; A. melanandra; *A. purpurea; *A. tetramera; *A. venosa.

*Aesculus arguta; *×A. Bushii; A. chinensis; A. discolor var. mollis; A. georgiana; *A. georgiana var. lanceolata; *A. georgiana var. pubescens; *A. glabra var. Buckleyi; *A. glabra var. leucodermis; *A. glaucescens; *×A. Harbisonii; *×A. mississippiensis; A. turbinata var. pubescens; *A. Wilsonii.

Ailanthus altissima var. sutchuenensis; A. Vilmoriniana.

*Akebia lobata var. australis.

Alangium platanifolium.

Albizzia coreana.

Alnus cremastogyne; A. firma; A. firma var. hirtella; *A. fruticosa var. mandshurica; A. hirsuta; A. hirsuta var. sibirica; A. lanata; *A. Maximowiczii; *A. mollis; A. pendula; *A. sinuata; A. tenuifolia.

Amelanchier asiatica var. sinica.

Ampelopsis aconitifolia var. palmiloba; A. brevipedunculata var. citrulloides; A. Delavayana; A. humulifolia; A. megalophylla; A. micans; *A. micans var. cinerea; A. Watsoniana.

Andrachne colchica; *A. phyllanthoides.

Aphananthe aspera.

Aralia chinensis; A. chinensis var. glabrescens.

Ardisia japonica.

Aristolochia heterophylla; A. Kaempferi; A. manshuriensis; A. moupinensis.

*Artemisia cana; *A. tripartita.

*Arundinaria Murielae.

Benzoin cercidifolium; B. grandifolium; B. obtusilobum; B. praecox; *B. trilobum; *B. umbellatum var. sericeum.

*Berberis aemulans; *B. aggregata; B. aggregata var. Prattii; B. aggregata var. recurvata; B. amurensis; *B. atrocarpa; *B. Beaniana; *B. Bergmanniae var. acanthophylla; *B. Boschanii; B. brachypoda; B. Bretschneideri; B. candidula; *B. circumserrata; B. consimilis; B. dasystachya; B. diaphana; B. dictyophylla; *B. dictophylla var. epruinosa; *B. Dielsiana; *B. Francisci-Ferdinandi; B. Gagnepainii; *B. Gilgiana; *B. Henryana; B. Julianae; *B. koreana; *B. Liechtensteinii; *B. morrisonensis; *B. Mouillacana; *B. Poiretii f. weichangensis; B. polyantha; *B. Purdomii; B. Rehderiana; *B. Sargentiana; *B. Sieboldii; *B. Silva-Taroucana; B. subcaulialata; *B. thibetica; B. Thunbergii var. Maximowiczii; *B. Thunbergii var. minor; *B. Tischleri; *B. triacanthophora; B. Veitchii; *B. Vernae; B. verruculosa; B. Wilsonae; B. Wilsonae var. Stapfiana; B. yunnanensis.

Berchemia volubilis.

Betula alba var. songarica; B. albo-sinensis; *B. albo-sinensis var. septentrionalis; B. chinensis; *B. coerulea; *B. coerulea var. Blanchardii; *B. corylifolia; *B. costata; B. davurica; B. Delavayi; B. Ermanii var. brevidentata; *B. Ermannii var. Saitoana; B. Ermannii var. subcordata; B. fontinalis; *B. fontinalis var. Piperi; B. grossa; B. japonica; B. japonica var. kamtschatica; B. japonica var. mandshurica; *B. japonica var. szechuanica; B. luminifera; B. mandshurica; B. Maximowicziana; B. Medwediewii; B. microphylla; B. Middendorfii; *B. neo-alaskana; B. papyrifera var. kenaica; *B. papyrifera var. subcordata; *B. Potaninii; *B. Sandbergii; *B. Schmidtii; B. utilis; B. utilis var. Prattii.

×Bignonia hybrida "Madame Galen".

Buddleia albiflora; B. Davidii; B. Davidii var. magnifica; *B. Davidii var. superba; B. Davidii var. Wilsonii; *B. Lindleyana var. sinuato-dentata; B. nivea; B. nivea var. yunnanensis; *B. officinalis; *B. stenostachya.

Buxus japonica; *B. microphylla var. koreana.

Callicarpa dichotoma; C. Giraldiana.

Camellia cuspidata.

Camptotheca acuminata.

*Campylotropis Falconeri; C. macrocarpa.

Caragana Boisii; *C. Maximowicziana; *C. sukiensis.

Carpinus Betulus var. carpinizza; C. Betulus f. fastigiata; C. Betulus f. globosa; C. cordata; C. cordata var. chinensis; *C. eximia; *C. Fargesiana; *C. Fauriei; *C. Henryana; *C. japonica; *C. laxiflora; C. laxiflora var. macrostachya; *C. Tschonoskii; *C. Turczaninovii; C. Turczaninovii var. ovalifolia.

*Carrierea calycina.

*Carya alba ovoidea *×C. Brownii; *×C. Brownii var. varians; *C. Buckleyi; *C. Buckleyi var. arkansana; *C. Buckleyi var. arkansana f. pachylemma; *C. Buckleyi var. villosa; *C. carolinae-septentrionalis; *C. cordiformis var. latifolia; ×*C. Dunbarii; *C. glabra var. megacarpa; *×C. Laneyi; *×C. Laneyii var. chateaugayensis; ×C. McAllisteri; *C. myristicaeformis; ×C. Nussbaumerii; *C. ovalis var. hirsuta; *C. ovata var. ellipsoidalis; *C. ovata var. fraxinifolia; *C. pallida; *C. texana.

*Cassiope selaginoides.

Castanea Henryi; C. mollissima; C. neglecta; C. Seguinii.

*Castanopsis ceratacantha; *C. platyacantha; C. sclerophylla.

*Catalpa Bungei; *C. Duclouxii; *C. Fargesii.

*Cedrela microcarpa; C. sinensis.

*Cedrus libani (hardy form from the Cilician Taurus).

Celastrus angulata; C. flagellaris; *C. gemmata; *C. glaucophylla; C. Hookeri; *C. hypoleuca; C. Loeseneri; *C. Rosthorniana; *C. rugosa.

Celtis australis; C. Biondii; C. Bungeana; C. caucasica; *C. cerasifera; C. Douglasii; C. jessoensis; *C. Julianae; *C. koraiensis; *C. labilis; *C. laevigata var. Smallii; *C. pumila var. Deamii; C. reticulata; C. Tournefortii.

Cephalotaxus drupacea var. sinensis; *C. nana.

*Ceratostigma Willmottianum.

*Cercidiphyllum japonicum var. sinense.

*Cercis racemosa.

Cercocarpus montanus.

*Chaenomeles lagenaria var. Wilsonii.

*Chamaebatiaria millefolium.

Chamaecyparis Lawsoniana var. Fletcheri; C. Lawsoniana var. lycopodioides; C. Lawsoniana var. tamariscifolia; *C. obtusa var. breviramea; *C. obtusa var. formosana.

Chionanthus retusus.

*Chloranthus serratus.

Chrysanthemum sibiricum.

Chrysothamnus pumilus.

*Citrus ichangensis.

*Cladrastis platycarpa; C. sinensis; *C. Wilsonii.

Clematis apiifolia; *C. apiifolia var. obtusidentata; C. Armandii; *C. Armandii f. Farquhariana; *C. chiisanensis; C. chinensis; C. columbiana; *C. Delavayi; *C. Fargesii; *C. Fargesii var. Soulieana; C. glauca var. akebioides; *C. glauca var. angustifolia; C. Gouriana; * G. Gouriana var. Finetii; *C. gracilifolia; *C. grata var. grandidentata; *C. grata var. lobulata; *C. heracleaefolia var. ichangensis; C. lasiandra; *C. macropetala; C. montana var. rubens; C. montana var. Wilsonii; *C. montana var. Wilsonii f. platysepala; C. paniculata var. dioscoreaefolia; *C. Pavoliniana; *C. Pierotii; *C. Prattii; C. pterantha; C. Rehderiana; C. serratifolia; *C. Spooneri; C. tangutica; *C. tangutica var. obtusiuscula; C. trullifera; C. uncinata; C. Veitchiana.

*Clematoclethra actinidioides; *C. integrifolia; *C. lasioclada var. grandis; *C. scandens.

Clerodendron trichotomum var. Fargesii.

*Clethra monostachya; C. Fargesii.

Cocculus trilobus.

*Columella oligocarpa.

*Comanthosphace sublanceolata.

Coriaria japonica; C. sinica.

Cornus alba var. Kesselringii; C. alba var. Rosenthalii; C. Bretschneideri; C. controversa; *C. florida f. xanthocarpa; *C. Hemsleyi; C. Hessei; C. Koenigii; *C. koreana; C. kousa (Chinese form); C. officinalis; C. paucinervis; C. poliophylla; C. pumila; C. sanguinea var. atrosanguinea; C. sanguinea var. viridissima; C. stolonifera var. coloradensis; C. stolonifera var. flaviramea; C. Walteri.

*Corylopsis glabrescens; *C. Gotoana; *C. platypetala; C. sinensis; C. Veitchiana; *C. Willmottiae.

Corylus avellana var. contorta; C. chinensis; C. heterophylla; *C. heterophylla var. sutchuenensis; C. mandshurica; C. Sieboldiana; C. tibetica.

*Cotinus americanus.

Cotoneaster acutifolia; *C. acutifolia var. villosula; C. adpressa; C. ambigua; C. amoena; *C. apiculata; C. bullata var. macrophylla; C. buxifolia var. vellaea; C. Dammeri; C. Dielsiana; *C. Dielsiana var. elegans; *C. divaricata; *C. foveolata; C. Franchetii; C. Henryana; C. horizontalis; C. horizontalis var. perpusilla; *C. hupehensis; C. ignava; C. moupinensis; *C. multiflora var. calocarpa; *C. nitens; C. obscura; *C. obscura var. cornifolia; C. racemiflora var. Veitchii; *C. racemiflora var. microcarpa; *C. racemiflora var. soongorica; *C. salicifolia; *C. salicifolia var. floccosa; C. salicifolia var. rugosa; C. Zabelii; *C. Zabelii var. miniata.

×Crataegomespilus Dardari; ×C. Dardari var. Asnieresii; ×C. grandiflora.

*Crataegus abjecta; *C. acclivis; *C. acerba; *C. acuminata; *C.

acutifolia; *C. acutiloba; *C. admiranda; *C. advena; *C. affinis; *C. alacris; *C. allecta; *C. alnorum; *C. ambitiosa; *C. ambrosia; *C. amnicola; *C. amoena; *C. amplifica; *C. anomala; *C. apiomorpha; *C. apposita; *C. aprica; *C. aquilonaris; *C. arcana; *C. arcuata; *C. ardua; *C. arduennae; *C. aridula; *C. arkansana; *C. arnoldiana; *C. ascendens; *C. aspera; *C. asperata; *C. asperifolia; *C. assurgens; *C. ater; *C. atrorubens; *C. attenuata; *C. angustata; *C. aulica; *C. austera.

*Crataegus baccata; *C. Balkwillii; C. barbara; *C. barrettiana; *C. Barryana; *C. Bartoniana; C. Bartramiana; *C. Bealii; *C. beata; *C. Beckiana; *C. bedfordensis; *C. bella; *C. bellica; *C. bellula; *C. benigna; *C. Berlandieri; *C. Bicknellii; *C. Bissellii; *C. blairensis; *C. Blanchardii; *C. blanda; *C. blandita; *C. bona; *C. Boothiana; *C. brachypoda; *C. bracteata; *C. Brainerdii; *C. brazoria; *C. Brittonii; *C. Brockwayae; *C. Brownietta; *C. Brunetiana; *C. Bushii.

Crataegus caesariata; *C. caesia; *C. caliciglabra; *C. callicarpa; *C. callophylla; *C. callosa; *C. calvescens; *C. Calvenii; *C. canadensis; *C. Canbyi; *C. candens; *C. Carrierei; C. celsa; *C. cerasina; *C. cestrica; *C. chadsfordiana; *C. champlainensis; *C. Chapmanii; *C. chateaugayensis; *C. chippewarensis; *C. Clintoniana; *C. coccineata; *C. coccinioides; *C. coerulescens; *C. cognata; *C. coloradensis; *C. colorado; *C. colorata; *C. columbiana; *C. comata; *C. compacta; *C. comparata; *C. compta; *C. condensa; *C. conferta; *C. confinis; *C. confragosa; *C. congestiflora; *C. conjuncta; *C. conspecta; *C. conspicua; *C. consarta; *C. contigua; *C. contortifolia; *C. contortula; *C. corporea; *C. crassifolia; *C. Crawfordiana; *C. cristata; *C. cruda; *C. crudilis; *C. Crusgalli var. oblongifolia; *C. Crus-galli var. ovalifolia; *C. Crus-galli var. rubescens; *C. culta; *C. cuprea; *C. cupulifera; *C. cyanophylla.

*Crataegus dacrioidea; *C. dallasiana; *C. Damei; *C. dasyphylla; *C. Dawsoniana; *C. Dayana; *C. debilis; *C. definata; *C. delawarensis; *C. delecta; *C. delectabilis; *C. delectata; *C. deltoides; *C. Delosii; *C. delucida; *C. demissa; *C. densiflora; *C. desueta; *C. Deweyana; *C. Dewingei; *C. diaphora; *C. diffusa; *C. digna; *C. dilatata; *C. disjuncta; *C. dissimilis; *C. dissona; *C. divergens; *C. diversifolia; *C. divida; *C. Dodgei; *C. Douglasii var. Suksdorfii; *C. drymophila; *C. dsungarica; *C. dumetosa; *C. dumicola; *C. Dunbari; *C. durobrivensis.

*Crataegus Eamesii; *C. Eastmaniana; *C. Eatoniana; *C. Edsonii; *C. effera; *C. efferta; *C. effulgens; *C. Eganii; *C. Egglestonii; *C. Ellwangeriana; *C. elongata; *C. Emersoniana; *C. Engelmannii; *C. enucleata; *C. erecta; *C. errata; *C. erythrocarpa; *C. erythropoda; *C. Evansiana; *C. exclusa; *C. exigua; *C. exornata.

Crataegus fallsiana; *C. Faxonii; *C. fecunda; *C. ferentaria; *C. ferox; *C. Ferrissii; *C. ferta; *C. fertilis; *C. filipes; *C. finitima; *C.

firma; *C. flabellata; *C. flagrans; *C. flammea; *C. flavida; *C. florea; *C. florifera; *C. fluviatalis; *C. foetida; *C. foliata; *C. Fontanesiana; *C. Forbesae; *C. formosa; *C. fortunata; *C. Fretzii; *C. fructuosa; *C. fucosa; *C. fulgens; *C. fulgida; *C. Fulleriana; *C. furcata.

*Crataegus gaudens; *C. Gaultii; *C. gemmosa; *C. geneseensis; *C. genialis; *C. georgiana; *C. gilva; *C. glabrata; *C. glabrifolia; *C. glabriuscula; *C. glariosa; *C. glaucophylla; *C. globosa; *C. gloriosa; *C. gracilipes; *C. gratiosa; *C. gravida; *C. gravis; *C. grignonensis; *C. Grubneri.

*Crataegus Habereri; *C. Halliana; *C. hamata; *C. Handyae; *C. Hargeri; *C. heidelbergensis; *C. Heldreichii; *C. Helenae; *C. hiemalis; *C. Hillii; *C. hirtella; *C. hispidula; *C. Holmesiana; *C. Holmesiana var. tardipes; *C. honesta; *C. horridula; *C. Howeana; *C. hudsonica; *C. hystricina.

*Crataegus ideae; *C. illecebrosa; *C. illinoiensis; *C. illuminata; *C. improvisa; *C. inaudita; *C. incaedua; *C. incerta; *C. incisa; *C. inducta; *C. induta; *C. infera; *C. infesta; *C. insignis; *C. insolens; *C. insolita; *C. inspirata; *C. integriloba; C. intricata; *C. inusitula; *C. invisa; *C. irrasa.

*Crataegus Jackii; *C. jasperensis; *C. Jenningsii; *C. jejuna; *C. Jonesae; *C. joyana; *C. jozoana.

*Crataegus Keepii; *C. Kellermanii; *C. Kennedyi; *C. Kinzerae; *C. kingstonensis; C. Korolkowii.

*Crataegus laetans; *C. lanceolata; *C. Laneyi; *C. lanigera; *C. lanuginosa; *C. larga; *C. lasiantha; *C. latifrons; *C. latisepala; *C. laurencensis; *C. laurentiana; *C. lauta; *C. laxiflora; *C. leioclada; *C. leiophylla; *C. lemingtonensis; *C. Lennoniana; *C. lenta; *C. leptophylla; *C. leptopoda; *C. Lettermanii; *C. leucorum; *C. levis; *C. limaria; *C. limosa; *C. littoralis; *C. livoniana; *C. lobulata; *C. locuples; *C. longipedicellata; *C. ludoviciana; *C. luminosa; *C. lutensis; *C. luxuriosa.

*Crataegus Macauleyae; *C. macera; *C. Macounii; *C. macrocalyx; *C. macrophylla; *C. macropoda; *C. macrosperma; *C. magnifolia; *C. maineana; *C. maligna; *C. marcida; *C. Margaretta; *C. Margaretta f. xanthocarpa; *C. Maribella; *C. matura; *C. Maximowicziana; *C. media; *C. medioxima; *C. Menandiana; *C. menstrata; *C. merita; *C. metniculosa; *C. micella; *C. michiganensis; *C. micrantha; *C. microsperma; *C. miniata; *C. miranda; *C. missouriensis; *C. mitis; *C. modesta; *C. modica; *C. Mohrii; *C. mollipes; *C. mollis; *C. monstrata; *C. montivaga; *C. munita.

*Crataegus napaea; *C. nemoralis; *C. neo-Bushii; *C. neo-fluvialis; *C. neo-londinensis; *C. nescia; *C. nitens; *C. nitida; *C. notabilis; *C. notha; *C. nuda; *C. numerosa; *C. nutans.

*Crataegus Oakesiana; *C. oblita; *C. ogdensburgensis; *C. olivacea; *C. opica; *C. opulens; *C. ornata; *C. otiosa; *C. ovata; *C. ovatifolia.

Crataegus pachyphylla; *C. Paddockeae; *C. padifolia; *C. Paineana; *C. Painteriana; *C. palliata; *C. pallidula; *C. Palmeri; *C. paradoxa; *C. parciflora; *C. Parkae; *C. parviflora; *C. parvula; *C. pastorum; *C. patrum; *C. paucispina; *C. pausiaca; *C. Peckii; *C. pectinata; *C. pedicellata; *C. pellucidula; *C. pennsylvanica; *C. Pennypackeri; *C. pentandra; *C. peoriensis; *C. pequotorum; *C. peramoena; *C. perampla; *C. peregrina; *C. perjucunda; *C. perlaeta; *C. perlevis; *C. permera; *C. perrara; *C. persimilis; C. persistens; C. philadelphica; *C. phleboxia; *C. pilifera; *C. pilosa; *C. pinguis; C. pinnatifida; C. pinnatifida var. major; C. pinnatiloba; *C. Piperi; *C. pisifera; *C. placida; *C. plana; *C. platycarpa; *C. polita; *C. polyclada; *C populnea; *C. porrecta; *C. Porteri; *C. praeclara; *C. praecogna; *C. praestans; *C. pratensis; *C. Pringlei; *C. Proctoriana; *C. prominens; *C. promissa; *C. prona; *C. propixa; *C. propria; *C. pruinosa; *C. pubifolia; *C. pudens; *C. pulcherima; *C. pulchra; *C. pumila; *C. punctata var. canescens; *C. punctata var. moselemensis; *C. punctata var. mutabilis; *C. pura; *C. pusilla; *C. puta; *C. putata; *C. pygmaea; *C. pyriformis; *Crataegus quercina; *C. quinebaugensis.

*Crataegus radiata; *C. radina; *C. radiosa; *C. Randiana; *C. recordabilis; *C. relicta; *C. remota; *C. repentina; *C. repulsans; *C. reses; *C. retrusa; *C. Reverchonii; *C. rhombifolia; *C. rigida; *C. rivalis; *C. Robesoniana; *C. Robinsonii; *C. robusta; *C. rotunda; *C. rotundata; *C. rotundifolia var. aboriginum; *C. rubicunda; *C. rubicundula; *C. rubrifolia; *C. rubrocarnea; *C. rudis; *C. rufipes; *C. ruricola; *C. rustica; *C. rutila.

*Crataegus saeva; *C. saligna; *C. sarniensis; *C. saturata; *C. Saundersiana; *C. saxatilis; C. scabra; *C. scabrida; *C. scitula; *C. Searsii; *C. seclusa; *C. secta; *C. sejuncta; *C. sera; *C. serena; *C. sertata; *C. setosa; *C. severa; *C. sextilis; *C. shirleyensis; *C. sicca; *C. sidera; *C. simulans; *C. simulata; *C. sinistra; *C. sitiens; *C. Slavinii; *C. Smithii; *C. sordida; *C. spatiosa; *C. speciosa; *C. spinulosa; *C. stenophylla; *C. Stonei; *C. stolonifera; *C. Streeterae; *C. strigosa; *C. strongylophylla; *C. structilis; *C. suavis; *C. submollis; *C. suborbiculata; *C. succincta; *C. swanensis.

*Crataegus taetrica; *C. tantula; *C. tarda; *C. tardipes; *C. Tatnalliana; *C. tenax; *C. tenella; *C. tenera; *C. tenuiloba; *C. tenuisepala; *C. texana; *C. Thayeri; *C. tomentosa; *C. torta; *C. tortuosa; *C. trachyphylla; *C. trahax; *C. trianthophora; *C. tribulosa; *C. tripartita; *C. triumphalis; *C. truculenta;

*Crataegus umbratilis; *C. umbrosa; *C. uniqua; *C. uplandia; *C. urbana; *C. uticaensis.

*Crataegus vaga; *C. vallicola; *C. varians; *C. vegeta; *C. velutina; *C. venulosa; *C. venusta; *C. venustula; *C. verecunda; *C. verruculosa; *C. vicina; *C. vicinalis; *C. villicarpa; *C. villiflora; *C. villipes; *C. virella; *C. viridimontana; *C. viridis; *C. vittata; *C. vivida.

*Crataegus Websteri; *C. Wheeleri; *C. Williamsii; *C. wilmorensis; *C. Wilsonii.

*Crataegus xanthophylla.

Cryptomeria japonica var. globosa nana.

*Cunninghamia Konishii.

Cytisus albus var. schipkaensis; ×C. Beanii; C. elongatus; C. glabrescens; C. nigricans; C. nigrescens var. Carlierii; C. purgans; C. scoparius var. Andreanus f. compactus.

Dalbergia hupeana.

Daphne altaica; D. altaica var. Sophia; D. caucasica; D. genkwa (Chinese form); *D. Giraldii; D. retusa; *D. tangutica.

Daphniphyllum humile.

Davidia involucrata; D. involucrata var. Vilmoriniana.

Debregeasia longifolia.

Decaisnea Fargesii.

*Decumaria sinensis.

*Desmodium serriferum; *D. spicatum; D. tiliaefolium.

*Deutzia coreana; D. discolor; *D. glabrata; D. glomeruliflora; *D. grandiflora; *D. hypoleuca; D. longifolia; *D. longifolia var. elegans; D. mollis; D. parviflora; D. parviflora var. ovatifolia; *D. pulchra; D. purpurascens; *D. Schneideriana var. laxiflora; D. setchuenensis; D. setchuenensis var. corymbiflora; D. Vilmorinae; D. Wilsonii.

*Diervilla florida var. venusta; D. japonica; D. japonica var. sinica; *D. Maximowiczii; D. Middendorfiana.

Dipelta floribunda; D. ventricosa;

Dipteronia sinensis.

*Disanthus cercidifolius.

*Echinopanax elatus.

Ehretia acuminata; E. Dicksonii.

Elsholtzia polystachya; *E. Stauntonii.

Emmenopterys Henryi.

*Enkianthus campanulatus var. albiflora; E. campanulatus var. Palibiniana; E. cernuus var. rubens; E. deflexus; E. quinqueflorus var. serrulatus; *E. subsessilis.

*Epigaea asiatica.

Eucommia ulmoides.

Euptelea Franchetii; *E. pleiosperma; E. polyandra.

Eurotia lanata.

Euscaphis japonica.

*Evodia Daniellii; E. glauca; E. Henryi; E. hupehensis; *E. officinalis; *E. velutina.

Evonymus acanthocarpa; *E. alata var. aperta; *E. aquifolium; E. Bungeana; E. Bungeana var. semipersistens; E. cornuta; *E. elegantissima; E. lanceifolia; E. Maackii; E. macroptera; E. nana; E. oxyphylla; E. planipes; *E. porphyrea; *E. radicans var. microphylla; *E. radicans

var. acuta; *E. radicans var. vegeta; E. sanguinea; *E. Sargentiana; E. subsessilis.

Exochorda Giraldii; *E. Giraldii var. Wilsonii; × E. macrantha; E. serratifolia.

*Fagus Engleriana; *F. japonica; *F. longipetiolata; *F. lucida; F. orientalis; *F. Sieboldii; F. sylvatica var. dawyckii.

Foresteeria neomexicana; *F. pubescens.

*Forsythia ovata; *F. suspensa f. pubescens; F. suspensa var. Fortunei f. atrocaulis; × F. intermedia var. spectabilis.

*Fortunearia sinensis.

*Fraxinus americana var. crassifolia; F. anomala; F. Bungeana; F. chinensis; F. chinensis var. rhynchophylla; F. dumosa; F. elonza; F. glabra; F. holotricha; F. Hookeri; *F. Lowellii; F. Mariesii; F. obliqua; F. obovata; F. oxycarpa; F. parvifolia; F. parvifolia var. monophylla; F. parvifolia var. nana; F. Paxiana; F. platypoda; F. potamophila; *F. profunda; F. pubinervis; F. Regelii; F. retusa var. Henryi; F. rotundifolia; F. rotundifolia var. pendula; F. Spaethiana; F. tamariscifolia; *F. texensis; F. velutina var. coriacea; F. velutina var. glabra; F. Veltheimii; F. Willdenowiana; F. xanthoxyloides.

*Gaultheria adenothrix; *G. cuneata; *G. moupinensis; G. Veitchiana.

Genista radiata.

*Gleditsia horrida; G. macracantha; G. sinensis; *×G. texana.

Glycyrrhiza suffrutescens; G. uralensis.

Gordonia axillaris.

Grewia parviflora; *G. parviflora var. glabrescens.

Gymnocladus chinensis.

*Hamamelis incarnata; H. japonica; H. japonica var. arborea; H. mollis; *H. vernalis; *H. virginiana var. rubescens.

Hedysarum multijugum.

*Helwingia chinensis; H. japonica.

Hemiptelea Davidii.

*Holboellia coriacea; *H. grandiflora.

Hydrangea anomala; H. arborescens var. urticifolia; H. Bretschneideri; *H. Bretschneideri var. setchuenensis; *H. Davidii; H. hirta; H. involucrata; H. longipes; H. opuloides var. cyanoclada; H. opuloides var. serrata; H. Rosthornii; *H. Sargentiana; H. strigosa; H. strigosa var. macrophylla; *H. villosa; H. xanthoneura; H. xanthoneura var. glabrescens; *H. xanthoneura var. Wilsonii.

*Hypericum aureum; *H. Buckleyi; *H. galioides; H. patulum var. Henryi.

*Idesia polycarpa var. vestita.

Ilex aquifolium var. chinensis; *I. ciliospinosa; I. corallina; I. crenata var. nummularia; I. decidua; I. Fargesii; I. fragilis; *I. Franchetiana; *I. geniculata; I. integra; I. leucoclada; I. longipes; *I. macrocarpa; *I. monticola; *I. opaca var. xanthocarpa; *I. pedunculosa; I. pedunculosa

f. continentalis; I. Pernyi; I. Pernyi var. Veitchii; I. purpurea var. Oldhamii; *I. rugosa; I. serrata; *I. serrata var. argutidens; *I. Sugerokii; *I. szechwanensis; *I. verticillata var. chrysocarpa; I. yunnanensis.

*Indigofera amblyantha; I. decora; I. hebepetala; I. Kirilowii; *I. Potaninii.

Itea ilicifolia.

Jasminum Beesianum; J. lanceolarium; J. urophyllum.

Juglans boliviensis; J. cathayensis; *J. formosana; ×J. intermedia; J. regia var. sinensis; J. rupestris; J. Sieboldiana var. cordiformis.

*Juniperus chinensis var. Sargentii; *J. communis var. Jackii; *J. communis var. nipponica; *J. conferta; J. formosana; *J. Pinchotii; J. rigida; *J. scopulorum; J. squamata var. Fargesii; *J. squamata var. Wilsonii; *J. taxifolia.

Kalmia caroliniana; K. cuneata; *K. hirsuta; *K. latifolia var. obtusata; *K. latifolia f. polypetala.

Koelreuteria apiculata.

Kolkwitzia amabilis.

Laburnum caramanicum.

Larix dahurica; L. dahurica var. japonica; *L. dahurica var. Principis Rupprechtii; ×L. eurolepis; *L. Kaempferi var. minor; *L. Lyallii; *L. Mastersiana; *L. occidentalis; ×L. pendula; L. Potaninii; L. sibirica.

Leptodermis oblonga.

*Lespedeza Buergeri; *L. Buergeri var. praecox; L. cyrtobotrya.

*Leucothoe Grayana; *L. Keiskei; *L. recurva.

*Ligustrum acuminatum; L. acuminatum var. macrocarpum; Ligustrum acutissimum; L. Delavayanum; L. Henryi; L. Quihoui.

Liquidambar formosana; *L. formosana var. monticola.

Liriodendron chinense; L. Tulipifera var. fastigiatum.

Lithocarpus cleistocarpa; L. Henryi.

Lonicera alseuosmoides; L. Altmannii L. Altmannii var. hirtipes; L. Altmannii var. pilosiuscula; L. angustifolia; L. arborea var. persica; L. arizonica; L. bella; L. bracteolaris; L. chaetocarpa; L. Chamissoi; *L. demissa; L. deflexicalyx; L. discolor; *L. Ferdinandii; L. Ferdinandii var. leycesterioides; L. Giraldii; L. gynochlamydea; L. Henryi; *L. heteroloba; L. hispida; L. involucrata var. flavescens; L. involucrata var. humilis; L. involucrata var. serotina; L. Koehneana; *L. Korolkovii; L. Korolkovii var. floribunda; L. lanceolata; L. Maackii; L. Maackii var. podocarpa; *L. Maackii var. podocarpa f. erubescens; L. Maximowiczii; *L. Maximowiczii var. sachalinensis; L. microphylla; L. minutiflora; L. Morrowii; *L. moupinensis; *×L. muendeniensis; *×L. muscaviensis; L. myrtilloides; L. Myrtillus; L. nervosa; *L. nitida; *L. notha; L. pileata; *L. praeflorens; L. prostrata; L. purpurascens; L. pyrenaica; L. quinquelocularis; L. rupicola; L. Ruprechtiana var. calvescens; *L. Ruprechtiana var. xanthocarpa; L. saccata; *L. Schneideriana; L. Semenovii; L. similis var. Delavayi; L. spinosa var. Alberti; L. Standishii

var. lancifolia; *L. strophiophora; *L. subaequalis; *L. subdentata; L. syringantha; L. syringantha var. Wolfii; *L. szechuanica; L. tangutica; *L. tatsienensis; *L. tenuipes; L. thibetica; L. tomentella; L. tragophylla; L. trichosantha; L. utahensis; L. Vilmorinii; L. Webbiana; L. xerocalyx; L. xylosteoides.

*Lysionotus pauciflorus.

*Maackia amurensis var. Buergeri; *M. chinensis; *M. Fauriei; M. Tashiroi.

Maddenia hypoleuca; *M. Wilsonii.

*Magnolia Dawsoniana; M. denudata var. purpurascens; *M. kobus var. borealis; *M. Nicholsoniana; M. officinalis; *M. parviflora (Korean form); *M. salicifolia; *M. Sargentiana; *M. Sargentiana var. robusta; M. Wilsonii.

*Malus baccata f. Jackii; M. baccata var. mandshurica; *M. bracteata; *M. coronaria var. Charlottae; *M. coronaria var. elongata; ×M. Eleyi; M. florentina; M. floribunda var. brevipes; *M. formosana; *M. glabrata; *M. ioensis var. Bushii; *M. ioensis var. Palmeri; *M. kansuensis; *M. kansuensis var. calva; *M. Komarovii; *M. lancifolia; ×M. magdeburgensis; M. micromalus; M. Prattii; M. prunifolia var. rinki; *M. prunifolia var. rinki (cult. Korea); M. pumila var. Niedzwitzkyana; M. robusta var. persicifolia; *M. Sargentii; M. Sieboldii; *M. Sieboldii var. arborescens; *M. Sieboldii var. calocarpa; M. sikkimensis; *M. spontanea; ×M. sublobata; M. theifera; M. theifera f. rosea; *M. toringoides; *M. transitoria; M. trilobata; *M. Tschonoskii; M. yunnanensis; M. zumi.

*Meliosma Beaniana; M. cuneifolia; M. myriantha; *M. pendens; *M. tenuis; M. Veitchiorum.

*Menziesia ciliicalyx; *M. multiflora; M. pentandra; *M. purpurea.

Morus acidosa; *M. cathayana; M. mongolica; *M. notabilis.

*Neillia longiracemosa; N. sinensis; *N. thibetica.

Nothopanax Davidii.

Orixa japonica.

Osmanthus armatus; *O. serrulatus.

*Osteomeles Schwerinae var. microphylla.

Ostrya carpinifolia; *O. japonica; *O. Knowltonii.

Ostryopsis Davidiana.

Pachystima myrsinites.

Paederia tomentosa.

Paeonia Delavayi; *P. Delavayi var. angustiloba; *P. suffruticosa (wild form).

Parrotiopsis Jacquemontiana.

Parthenocissus Henryana; P. himalayana; *P. himalayana var. rubrifolia; *P. laetevirens; P. Thomsonii.

*Paulownia Mikado; *P. tomentosa var. lanata.

*Pentactina rupicola.

*Pentapanax Henryi.

*Periploca sepium.

Petrophytum caespitosum.

Phellodendron amurense; P. chinense; P. Lavalleii; *P. sachalinense.

*Philadelphus argyrocalyx; P. Delavayanus; P. incanus; P. Magdalenae; *P. microphyllus; P. pekinensis; P. pekinensis var. brachybotrys; P. purpurascens; *P. sericanthus var. Rehderianus; *P. serpyllifolius; P. Schrenkii var. Jackii; P. subcanus; P. tenuifolius.

Photinia Beauverdiana var. notabilis; *P. Davidsoniae; *P. subumbellata; P. villosa var. laevis; P. villosa var. sinica.

Phyllodoce glanduliflora; *P. nipponica.

Picea Abies var. aclada; P. Abies var. conica elegans; P. Abies var. decumbens; P. Abies var. dumosa; P. Abies var. elegans; P. Abies var. nidiformis; P. Abies var. pachyphylla; P. Abies var. prostrata; P. Abies var. pygmaea globosa; P. Abies var. pyramidalis compacta; P. Abies var. pyriformis; P. Abies, var. repens; *P. ascendens; *P. asperata; *P. asperata var. notabilis; *P. asperata var. ponderosa; *P. aurantiaca; *P. Balfouriana; *P. Breweriana; P. complanata; *P. Engelmannii; *P. glauca var. albertiana f. conica; P. glauca var. compacta globosa; P. glauca var. nana; P. Glehnii; *P. heterolepis; *P. koraiensis; *P. Koyamai; *P. Meyeri; *P. montigena; *P. morrisonicola; P. omorika; *P. pungens var. compacta; *P. purpurea; *P. retroflexa; P. rubra var. virgata; *P. Sargentiana; P. Watsoniana; *P. Wilsonii.

Picrasma quassioides.

*Pieris nana; P. ovalifolia var. lanceolata; *P. taiwanensis.

*Pilostegia viburnoides.

Pinus Armandi; P. echinata; P. leucodermis; P. peuke; P. pumila; P. sinensis; *P. sinensis var. densata; *P. sinensis var. yunnanensis; P. Strobus var. fastigiata; *P. Strobus var. prostrata.

Piptanthus concolor.

*Pittosporum daphniphylloides; P. glabratum; *P. heterophyllum; P. truncatum.

Platanus Wrightii.

Platycarya strobilacea.

Poliothyrsis sinensis.

Polygonum multiflorum.

*Populus adenopoda; *×P. Andrewsii; × P. generosa; *P. koreana; P. lasiocarpa; *P. Palmeri; P. Petrowskiana; P. Sieboldii; *P. szechuanica; P. tomentosa; *P. tremula var. Davidiana; *P. tremula var. Davidiana f. tomentella; *P. Wilsonii.

*Potentilla fruticosa var. albicans, *P. fruticosa var. parvifolia; P. fruticosa var. Purdomii; P. fruticosa var. tenuifolia; P. fruticosa var. Veitchii; P. Vilmoriniana.

Prinsepia sinensis; *P. uniflora.

*Prunus alabamensis; *P. alleghaniensis; *P. alleghaniensis var. Davisii; ×P. amygdalo-persica; P. apetala; P. armeniaca var. mikado;

*P. australis; P. baldschuanica; *P. bicolor; *P. brachypoda var. pseudossiori; P. Buergeriana; P. campanulata; P. canescens P. cerasifera var. divaricata; P. concinna; *P. Conradinae; *P. Cuthbertii; *P. cyclamina; P. dasycarpa; P. dasycarpa var. salicifolia; P. Davidiana; *P. dehiscens; *P. Dielsiana; *P. discadenia; P. emarginata; *P. glyptocarya; *P. gracilis; *P. Gravesii; *P. hortulana var. pubens; P. humilis; P. incana; P. incisa; *P. incisa f. serrata; P. Jacquemontii; *P. japonica var. Nakaii; P. Lannesiana f. albida; P. Lannesiana f. benitoranowo; P. Lannesiana f. botanzakura; P. Lannesiana f. chosiuhizakura; P. Lannesiana f. fudanzakura; P. Lannesiana f. fukurokuju; P. Lannesiana f. gijozakura; P. Lannesiana f. gozanomanioi; P. Lannesiana f. hatazakura; P. Lannesiana f. higurashi; P. Lannesiana f. horaisan; P. Lannesiana f. jonioi; P. Lannesiana f. kokesimidsu; P. Lannesiana f. mazakura; P. Lannesiana f. mikurumakaisi; P. Lannesiana f. miyako; P. Lannesiana f. ohsibayama; P. Lannesiana f. sobanzakura; P. Lannesiana f. sumizome; P. Lannesiana f. surugadainioi; P. Lannesiana f. takinioi; P. Lannesiana f. temari; P. Lannesiana f. yedozakura; P. Laucheana; P. Laurocerasus var. schipkaensis; *P. lobulata; P. Maackii; *P. malifolia; *P. Maximowiczii; *P. mexicana; *P. mexicana var. fultonensis; P. microcarpa; *P. micromeloides; *P. mira; P. emarginata var. mollis; P. nana; P. nana var. caucasica; P. nana var. transcaucasica; P. nipponica; P. nipponica var. kurilensis; *P. orthosepala; P. Padus var. Albertii; P. Padus var. commutata; P. Padus var. heterophylla; P. Padus var. parviflora; P. Padus var. sibirica; *P. perulata; P. Petunikovii; *P. pilosiuscula var. barbata; *P. pilosiuscula var. media; *P. pleiocerasus; *P. pleuroptera; *P. plurinervis; *P. polytricha; P. prostrata; *P. pubigera var. obovata; *P. pubigera var. Prattii; *P. Reverchonii; P. rufomicans; P. salicina (wild form); *P. serrula var. tibetica; P. serrulata var. pubescens; P. serrulata var. pubescens f. meigetsu; P. serrulata var. pubescens f. taizanfukun; P. serrulata f. rosea; *P. serrulata var. sachalinensis; P. serrulata var. sachalinensis f. horinji; P. serrulata var. sachalinensis f. kokonaye; P. serrulata var. sachalinensis f. ohnanden; P. serrulata var. sachalinensis f. sekiyama; P. serrulata var. sachalinensis f. shogetsu; P. serrulata var. sachalinensis f. udzuzakura; P. serrulata var. spontanea; P. serrulata var. spontanea f. kosioyama; P. serrulata var. spontanea f. praecox; P. sibirica; P. Sieboldii f. yokihi; P. Ssiori; *P. stellipila; *P. subhirtella; *P. subhirtella var. ascendens; *P. tatsienensis var. stenadenia; P. tomentosa; P. tomentosa var. endotricha; P. triloba var. normalis; *P. variabilis; *P. venosa; *P. virens; P. virginiana var. demissa f. pachyrrachis; P. virginiana var. leucocarpa; *P. Watsonii; P. Wilsonii var. leiobotrys; P. yedoensis.

Pseudotsuga japonica.

*Ptelea Baldwinii; *P. isophylla; P. polyadenia.

Pterocarya hupehensis; P. Paliurus; P. rhoifolia.

Pteroceltis Tatarinowii.

Pterostyrax corymbosum; P. hispidum.

*Pyracantha Gibbsii; P. Koidzumii.

Pyrus amygdaliformis; P. amygdaliformis var. oblongifolia; P. Balansae; P. betulaefolia; P. Bretschneideri; *P. Calleryana; *P. Calleryana var. dimorphophylla; *P. Calleryana var. Fauriei; *P. Calleryana var. tomentella; P. communis var. cordata; P. communis var. cotinifolia; P. communis var. fascicularis; P. communis var. pyraster; *P. Kawakamii; P. Korshinskyi; P. Michauxii; P. pashia; P. persica; P. phaeocarpa; P. phaeocarpa var. globosa; P. Pyrainus; P. serotina; *P. serrulata; P. ussuriensis; *P. ussuriensis var. hondoensis; P. ussuriensis var. ovoidea.

*Quercus aliena; *Q. aliena var. acuteserrata; *Q. aliena var. acuteserrata f. calvescens; Q. aquifolioides var. rufescens; *Q. arkansana; Q. Baronii; ×Quercus Bebbiana; *Q. ellipsoidalis; *Q. Engleriana; Q. Gambelii; Q. Gilliana; Q. glandulifera; *Q. glauca var. gracilis; ×Q. guadalupensis; Q. Gunnisonii; *Q. Havardii; *×Q. Jackii; *Q. Laceyi; *×Q. Leana; *Q. leptophylla; *Q. liaotungensis; Q. libani var. angustifolia; Q. lyrata; Q. macedonica; Q. macranthera; *Q. mongolica; *Q. mongolica var. grosseserrata; *Q. Muehlenbergii var. Brayi; *Q. nigra var. tridentifera f. microcarya; *Q. nitescens; Q. oxyodon; *Q. pachyloma; *× Q. Rehderi; Q. pontica; *×Q. Robbinsii; Q. robur var. pectinata; *Q. rubra var. pagodaefolia; *×Q. runcinata; Q. semicarpifolia; Q. serrata; Q. serratifolia; Q. sessiliflora var. insecata; Q. sessiliflora var. Louettei; *Q. Shumardii; *Q. Shumardii var. Schneckii; *Q. stellata var. Boyntonii; ×Q. subfalcata var. microcarpa; Q. toza; *Q. undulata; *Q. utahensis; *Q. utahensis var. submollis; Q. variabilis; *Q. velutina var. missouriensis.

*Reevesia pubescens.

Rhamnella franguloides.

Rhamnus costata; R. crenata; *R. dumetorum; *R. dumetorum var. crenoserrata; R. fallax; *R. heterophylla; *R. hupehensis; *R. koraiensis; *R. leptacantha; R. leptophylla; *R. Leveilleana; R. nipponica; *R. paniculiflora; R. parviflora; *R. Rosthornii; *R. Sargentiana; *R. Schneideri; R. utilis; R. virgata.

*Rhododendron alabamense; *R. Albrechtii; R. ambiguum; *R. Amesiae; R. argyrophyllum; R. argyrophyllum var. cupulare; R. Augustinii; *R. austrinum; *R. bracteatum; R. calophytum; *R. Chapmanii; R. concinnum; *R. Davidsonianum; R. decorum; R. discolor; *R. Edgarianum; R. Faberi; R. Fargesii; R. flavidum; *R. floribundum; R. Fortunei var. Houlstonii; *R. galacteum; *R. Hanceanum; *R. Hunnewellianum; R. hypoglaucum; R. indicum; *R. insigne; R. intricatum; R. japonicum; *R. japonicum f. aureum; *R. Keiskei; R. linearifolium var. macrosepalum; R. longesquamatum; *R. longistylum; R. lutescens; R. maculiferum; R. Mariesii; *R. Metternichii; R. micranthum; *R. Morii; *R. moupinense; R. mucronulatum; R. mucronatum f. sekidera; *R. mucronulatum var. ciliatum; *R. nipponicum; *R. obtusum var.

japonicum; *R. obtusum var. Kaempferi; *R. obtusum var. Kaempferi f. multicolor; R. Oldhami; R. orbiculare; R. oreodoxa; R. pachytrichum; *R. phoenicium var. tebotan; R. pittosporaefolium; R. polylepis; *R. prunifolium; R. Przewalskii; *R. pseudochrysanthum; R. reticulatum; *R. rubropilosum; *R. Sargentianum; R. scabrum; R. Schlippenbachii; *R. Searsiae; *R. semibarbatum; *R. serrulatum; R. Smirnovii; R. Souliei; *R. stamineum; *R. strigillosum; R. sutchuenense; R. taliense; *R. Thayerianum; *R. tosaense; T. Tschonoskii; R. Ungerni; *R. violaceum; R. Wasonii; R. Watsonii; *R. Websterianum; *R. Weldianum; *R. Weyrichii; *R. Williamsianum; R. yanthinum; *R. yedoense var. poukhanense.

KURUME AZALEAS

Rhododendron obtusum var. *japonicum f.*

"Agemaki"
"Aioi"
"Asagasumi"
"Aya Kammuri"
"Azuma Kagami"
"Benifude"
"Bijinsui"
"Fudesute Yama"
"Gosho Zakura"
"Hachika Tsugi"
"Hana Asobi"
"Hinode No Taka"
"Hoō"
"Ima Shōjō"
"Irohayama"
"Kasane Kagaribi"
"Kasumi Gaseki"
"Katsura No Hana"
"Kimigayo"
"Kirin"
"Kiritsubo"
"Kumo No Uye"
"Kurai No Himo"
"Kureno Yuki"
"Nani Wagata"
"Oinō Mezame"
"Omoine"
"Osaraku"
"Osaraku Seedling"
"Otome"
"Rashō Mon"
"Sakura Tsukasa"
"Saotome"
"Seikai"
"Shin Seikai"
"Shin Utena"
"Shintoki No Hagasane"
"Suetsumu"
"Suga No Ito"
"Suiyōhi"
"Takasago"
"Tama No Utena"
"Tamafuyo"
"Tancho"
"Tsuta Momiji"
"Ukamuse"
"Waka Kayede"
"Yayehiryu"
"Yorozuyo"

Rhus Potaninii; R. punjabensis var. sinica; *R. sylvestris; *R. trichocarpa; *R. trilobata; R. verniciflua.

Ribes aciculare; R. alpestre; *R. alpestre var. giganteum; R. alpinum var. pumilum; *R. ambiguum; R. burejense; *R. cognatum; R. dikuscha var. appendiculatum; R. fasciculatum; R. fasciculatum var. chinense;

× R. fuscescens; R. Giraldii; R. glaciale; *R. glaciale var. angustisepala; R. grossularioides; *R. Henryi; R. heterotrichum; *R. himalayense var. atropurpureum; R. himalayense var. urceolatum; *R. japonicum; *R. laurifolium; R. laxiflorum; R. leptanthum; R. longeracemosum; *R. longeracemosum var. Wilsonii; R. luridum; *R. magellanicum; R. mandshuricum var. subglabrum; R. Maximowiczii; *R. mescalerium; R. Meyeri var. turkestanicum; R. montigenum; R. moupinense; *R. moupinense var. laxiflorum; R. orientale; *R. parvulum; *R. petiolare; R. petraeum; R. petraeum var. altissimum; R. petraeum var. Biebersteinii; *R. pinetorum; *R. Pringlei; R. procumbens; R. saxatile; R. Spaethianum; R. stenocarpum; ×R. succirubrum; R. tenue; Ribes tricuspe; R. ussuriense; R. Vilmorinii; *R. viscosissimum.

Robinia Hartwigii; *R. neomexicana.

*Rosa adenosepala; R. amblyotis; *R. Bakeri; R. banksiopsis; *R. bella; *R. bella var. pallens; R. caudata; R. corymbulosa; R. Davidii; R. Davidii var. elongata; R. Ecae; *R. filipes; R. foliolosa; R. Gentiliana; R. Giraldii var. venulosa; *R. glomerata; R. Helenae; R. Hugonis; R. jaluana; *R. koreana; R. longicuspis; *R. Lyonii var. alba; *R. McDougalii; *R. Macounii; *R. Maximowicziana var. Jackii; *R. Maximowicziana var. pilosa; R. Moyesii; R. Moyesii f. rosea; R. multibracteata; R. multiflora; *R. multiflora var. cathayensis; *R. Murielae; R. omeiensis; *R. omeiensis var. chrysocarpa; R. omeiensis f. pteracantha; *R. Palmeri; R. persetosa; *R. Prattii; *R. pyrifera; R. Roxburghii var. hirtula; R. Roxburghii var. normalis; R. Rubus; R. saturata; R. sertata; R. setipoda; *R. Spaldingii; R. spinosissima var. altaica; R. spinosissima "Dominic Sampson"; R. spinosissima "Iris"; R. spinosissima "Jupiter"; R. spinosissima "King of the Scots"; R. spinosissima "Plato"; R. spinosissima var. pusilla; R. spinosissima "Pythagoras"; *R. stellata var. mirifica; R. subserrulata; *R. suffulata; R. Sweginzowii; R. tuschetica; *R. ultramontana; R. Wichuraiana; R. Willmottiae.

Rubus adenophorus; *R. amabilis; *R. amnicolus; R. Andrewsianus; R. arcticus; *R. arundelanus; R. aurantiacus; *R. biflorus var. quinqueflorus; *R. biformispinus; R. caesius var. turkestanicus; R. chroösepalus; R. corchorifolius; R. coreanus; R. crataegifolius; R. flagelliflorus; *R. flosculosus; R. flosculosus f. parvifolius; R. Fockeanus; R. Gentilianus; R. geophilus; *R. Giraldianus; *R. glandicaulis; R. Henryi; R. hupehensis; R. ichangensis; R. innominatus; R. innominatus var. Kuntzeanus; R. inopertus; R. irenaeus; *R. Jeckylanus; *R. junceus; R. Koehneanus; R. Lambertianus; *R. lasiostylus var. dizygos; R. macilentus; R. melanolasius; R. mesogaeus; *R. multiformis; *×R. neglectus; *R. orarius; R. Parkeri; R. parvifolius; *R. peculiaris; R. platyphyllus; R. Playfairianus; *R. plicatifolius; R. pungens; *R. recurvans; *R. recurvicaulis; *R. recurvicaulis var. inarmatus; R. semierectus; R. setchuenensis; *R. setosus; *R. spectabilis var. vernus; *R. tardatus; R. thibetanus; R. trianthus; *R. tricolor; R. vicarius; R. xanthocarpus.

*Sabia latifolia; *S. Schumanniana.

*Sageretia pycnophylla.

*Salix Bockii; *S. cardiophylla; *S. cathayana; *S. eriocarpa; *S. Fargesii; *S. Gilgiana; *S. hypoleuca; *S. jessoensis; *S. koreensis; *S. macroblasta; *S. magnifica; *S. Matsudana; *S. moupinensis; *S. phanera; *S. purpurea var. multinervis; *S. Rehderiana; *S. subfragilis; *S. Wallichiana.

Sambucus canadensis f. maxima; *S. canadensis var. subtomentosa; S. microbotrys; S. melanocarpa; S. racemosa var. Sieboldiana; *S. Schweriniana.

*Sapindus Drummondii.

Sarcococca Hookeriana var. digyna; S. Hookeriana var. humilis; S. ruscifolia.

*Sargentodoxa cuneata.

*Sassafras randaiensis; S. tzumu.

Schizandra chinensis; *S. glaucescens; S. grandiflora; S. Henryi; S. nigra; S. propinqua var. sinensis; *S. rubriflora; *S. sphenanthera.

Schizophragma integrifolium; S. integrifolium var. molle.

Securinega fluggeoides; S. ramiflora.

Sibiraea laevigata var. angustata; S. tomentosa.

*Sinofranchetia chinensis.

Sinomenium acutum; S. acutum var cinereum.

*Sinowilsonia Henryi.

*Smilax discotis var. concolor; *S. longipes; *S. megalantha; *S. menispermoides; *S. scobinicaulis; *S. Sieboldii; *S. trachypoda; *S. vaginata.

Solanum Dulcamara var. chinense.

*Sophora affinis; S. japonica var. pyramidalis; S. japonica var. pubescens; *S. japonica var. vestita; S. viciifolia.

Sorbaria Aitchisonii; S. arborea; *S. arborea var. glabrata; *S. arborea var. subtomentosa; S. assurgens; S. stellipila.

×Sorbaronia Dippelii; ×S. fallax; ×S. heterophylla.

×Sorbopyrus auricularis; ×S. auricularis var. bulbiformis.

*Sorbus alnifolia; *S. alnifolia var. lobulata; *S. alnifolia var. submollis; S. angustifolia; S. Aria var. Decaisneana; S. caloneura; S. chamaemespilus; S. commixta; *S. commixta var. rufo-ferruginea; *S. Conradinae; S. discolor; *S. Esserteauiana; *S. expansa; S. Folgneri; S. Folgneri var. pendula; S. Hostii; *S. hupehensis var. aperta; *S. japonica var. calocarpa; *S. Koehneana; *S. megalocarpa; *S. megalocarpa var. cuneata; *S. meliosmifolia; S. Mougeotii; *S. multijuga; *S. multijuga var. microdonta; *S. munda f. subarachnoidea; *S. munda f. tatsienensis; S. occidentalis; *S. pallescens; *S. plantierensis; S. pohuashanensis; *S. randaiensis; *S. Rehderiana; S. sambucifolia; *S. Sargentiana; *S. scalaris; S. scopulina; S. serotina; *S. setschwanensis; *S. unguiculata; S. Vilmorinii; S. Wilsonii; S. Zahlbruckneri.

Sphaeralcea remota.

×Spiraea arguta; ×S. assimilis; ×S. blanda; S. bullata; S. calcicola; S. canescens; S. dahurica var. canescens; S. dasyantha; ×S. Foxii; S. gemmata; S. Henryi; S. japonica var. acuminata; *S. japonica var. ovalifolia; *S. koreana; S. longigemmis; S. lucida; ×S. macrostachya; ×S. Margaritae; ×S. microthyrsa; *S. Miyabei var. glabrata; *S. mollifolia; ×S. mollis; ×S. multiflora; S. myrtilloides; S. nipponica; ×S. notha; ×S. nudiflora; *S. obtusa; ×S. oxyodon; ×S. pachystachya; ×S. pikoviensis; S. prunifolia var. simpliciflora; S. pubescens; *×S. pyramidata; ×S. revirescens; *S. Rosthornii; *S. Sargentiana; ×S. Schinabeckii; ×S. semperflorens; ×S. superba; *S. sylvestris; ×S. syringiflora; *S. trichocarpa; ×S. tristis; *S. ulmifolia (Korean form); S. vaccinifolia; S. Veitchii; *S. virginiana var. serrulata; S. Wilsonii.

Spondias axillaris.

*Stachyurus chinensis; S. praecox.

*Staphylea Bolanderi; S. holocarpa; S. holocarpa var. rosea.

Stewartia monadelpha.

*Stranvaesia Davidiana; S. Davidiana var. undulata.

Styrax Hemsleyanus; *S. Shiraiana; *S. Veitchiorum; *S. Wilsonii.

Sycopsis sinensis.

×Symphoricarpos Chenaultii; *S. oreophilus; *S. sinensis.

*Syringa affinis; *S. dilatata; *S. formosissima; ×S. Henryi var. eximia; ×S. Henryi var. Lutèce; S. Koehneana; *S. Komarowii; *S. Komarowii var. Sargentiana; *S. microphylla; *S. Palibiniana; *S. pinnatifolia; S. reflexa; *S. Rehderiana; S. Sweginzowii; S. tomentella; S. vulgaris (wild type); S. Wolfii.

*Taiwania cryptomerioides.

Tapiscia sinensis.

Taxus brevifolia (from Idaho and Montana); *T. chinensis.

Tetracentron sinense.

*Tetrastigma obtectum var. pilosum.

*Thuja koraiensis; T. plicata (hardy Idaho form); T. plicata var. nana.

*Thujopsis dolobrata var. Hondai.

Tilia caroliniana; *T. caroliniana var. rhoophila; T. floridana; *T. insularis; T. intonsa; *T. Maximowicziana; T. Miqueliana; T. Oliveri; T. tuan; *T. tuan var. chinensis.

*Triosteum Fargesii.

*Tripetaleia bracteata; *T. paniculata.

*Tripterygium Regelii.

Trochodendron aralioides.

*Tsuga caroliniana; T. chinensis; *T. yunnanensis.

*Tsusiophyllum Tanakae.

Ulmus Bergmanniana; U. foliacea var. umbraculifera; *U. japonica; U. laciniata; *U. laciniata var. nikoensis; U. pumila var. pinnato-ramosa; *U. serotina; *U. Wilsoniana.

Vaccinium Buergeri; V. ciliatum; *V. fragile; *V. hirsutum; V. hirtum var. Smallii; V. japonicum; V. membranaceum; *V. moupinense; *V. praestans; V. scoparium; *V. urceolatum.

Viburnum betulifolium; V. bitchuense; *V. bracteatum; V. buddleifolium; *V. Canbyi; *V. cinnamomifolium; V. cylindricum; *V. dasyanthum; V. Davidii; V. erosum; *V. erubescens var. Prattii; V. foetidum var. rectangulum; *V. furcatum; V. Henryi; V. hupehense; V. ichangense; *V. kansuense; V. lobophyllum; *V. lobophyllum var. flocculosum; *V. molle; V. mongolicum; V. phlebotrichum; V. propinquum; V. rhytidophyllum; V. Sargentii; *V. Sargentii f. flavum; V. shensianum; V. theiferum; *V. urceolatum; V. utile; V. Veitchii; *V. Wilsonii; V. Wrightii.

Vitis amurensis; ×V. Baileyana; V. betulifolia; V. Coignetiae; V. Davidii; V. Davidii var. cyanocarpa; V. flexuosa; V. flexuosa var. parvifolia; V. pentagona; *V. pentagona var. bellula; V. Piasezkii; V. pulchra; V. reticulata; *V. Thunbergii var. sinuata; V. vinifera (form cultivated at Peking).

Whipplea modesta.

*Xylosma racemosum var. pubescens.

Zanthoxylum alatum var. planispinum; Z. Bungei; Z. dissitum; *Z. Piasezkii; Z. piperitum; Z. setosum.

The following hybrid trees and shrubs have been made at the Arboretum or have appeared in it spontaneously:

Roses

Arnoldiana	Pauline Dawson
Dawson	Jacksonii
Farquhar	Sargent
Ida	Seashell
Lady Duncan	W. C. Egan
Minnie Dawson	

Aesculus Harbisonii	Malus arnoldiana
Cornus arnoldiana	Malus Dawsoniana
Berberis notabilis	Prunus arnoldiana
Betula Jackii	Pterocarya Rehderiana
Forsythia intermedia var. primulina	Pyrus congesta
Hypericum arnoldianum	Rhododendron Anneliesae
Hypericum Dawsonianum	Rhod. obtusum v. arnoldianum
Hypericum nothum	Sorbus arnoldiana
Lonicera amoena var. arnoldiana	Viburnum Jackii

HAWTHORNS.

During the last twenty-three years special attention has been given at the Arboretum to the study and cultivation of North American Hawthorns. Previous to 1899 some twenty species and varieties only had been recognized by botanists, but in that year a number of the plants raised from

seeds collected principally in Missouri in 1880 flowered and produced fruit, and showed characters so distinct from those of any of the described species that a critical study of the genus as it appears in North America seemed desirable. In carrying out this investigation specimens have been collected in every state of the United States and in every Province of the Dominion of Canada, and 4269 different lots of seeds have been planted at the Arboretum and some two hundred thousand plants have been raised. No less than 1056 species and varieties have been distinguished by botanists in these twenty-three years and of these 672 species and varieties have been described by the Director of the Arboretum.

The living collection of these trees and shrubs which are often conspicuous in spring and autumn from the beauty and abundance of their flowers and highly colored fruits now contains seven hundred and thirty-five species and varieties, and make one of the interesting features of the Arboretum. Thousands of these plants raised at the Arboretum have been distributed in this country and Europe; and nearly complete collections have been established in the parks of Rochester, New York, and in England.

THE HERBARIUM

The necessity of a collection of dried plants for the correct determination of the living collections and for successful dendrological studies was felt in the earliest days of the Arboretum, but it was not until 1878 that the beginning of an herbarium was made. In that year Mr. John Robinson of Salem came to the Arboretum as curator of the proposed herbarium and began to gather specimens for it. Four years later he was succeeded as curator by Mr. Charles E. Faxon who remained in general charge of the herbarium until his death in 1918. He was succeeded by Mr. Alfred Rehder who is now the curator. The herbarium, which is confined to specimens of trees, shrubs and suffrutescent plants, now contains two hundred thousand sheets and a large number of fruits. It is hoped that it will be extended until it contains a representative of every ligneous plant in the world from the Arctic Circle of the two hemispheres to the equator. The silvas now best represented in the herbarium are those of North America and eastern Asia. Plants, however, are found in it from all the continents, and from nearly every country, and the only regions botanically important which are not represented are Madagascar, New Caledonia and New Guinea.

The first important collections of North American plants were made in 1880 and 1881 by the Director and his assistants engaged in preparing for the general government a report on the forests and forest wealth of the United States. The study of North American trees and shrubs begun forty years ago has been steadily continued to the present time, and large quantities of material have been gathered for the herbarium in every part of the country by officers of the Arboretum and collectors employed for the purpose. The herbarium received its first Asiatic plants in 1892 when the

Director brought back from Japan a collection of about one thousand specimens. It was later enriched by the specimens collected in Japan, northern China and Korea by Mr. J. G. Jack of the Arboretum staff, by Purdom, Meyer, Sargent and Hers in northern China, by Henry in western China, by the collections of E. H. Wilson in western China, Korea and the entire Japanese Empire of about 8500 specimens, by the specimens collected by C. Schneider in southwestern China, and by several collections of the plants of the Philippine Islands made under the direction of the Philippine Bureau of Science.

The herbarium contains several collections made from trees and shrubs cultivated in Europe. The most important of them were made by Mr. George Nicholson in the Royal Gardens at Kew, by Dr. C. Naudin at the Villa Thuret at Antibes in France, by A. Rehder and C. Schneider chiefly in Germany, and by H. Zabel of Muenden, Germany, containing the types of the numerous species, varieties and hybrids published by him.

The attempt has been made in the Arboretum herbarium to show in the case of important trees the varieties and range of the species, and from one hundred to three hundred sheets are occasionally devoted to the illustration of a single species and its varieties; in the case of trees like Oaks and Hickories the sheets are accompanied by many bottles of nuts.

The Pinaceae is the family best represented in the Arboretum herbarium. All the genera and all the species of this Family are represented with the exception of six Araucarias from New Caledonia, two species of Callitris and three species of Agathis from northern Australia, one Juniper from San Domingo and another from the Azores. Many of the species are represented by long series of specimens and by enough cones to show the range of their variation.

The herbarium contains the types of nearly all the new Chinese species published by the Arboretum in Plantae Wilsonianae, the new species published in Garden and Forest, in Trees and Shrubs, and in the Journal of the Arnold Arboretum, and of the new species and varieties of Crataegus, Carya, Quercus, Tilia, Aesculus and other genera published by the Director.

In its early years the office of the Arboretum and the herbarium and Library were established in a house in Brookline controlled by the Director, but in 1892 Mr. Horatio Hollis Hunnewell, a constant and devoted friend to the Arboretum, as have been his sons, furnished the money for the brick building near the Jamaica Plain entrance, and late in that year the offices for administration, the herbarium and the library were moved into it. This building also contains a collection of specimens of the wood and bark of most of the trees of the United States, a gift with the cases in which they are arranged of the late Morris K. Jesup of New York. In 1905 a fireproof four-storied wing was added to the Administration Building to contain the herbarium which is now arranged in steel cases extending to the ceiling of the low-studded and well lighted rooms conveniently arranged for the study of the specimens.

THE LIBRARY

The Library of the Arboretum now contains 35,500 bound volumes and 8000 pamphlets. It was begun in 1873 when the Director bought for his own use a few books needed for the arrangement of the future Arboretum. This small library was gradually increased and when a few years later it was determined to prepare at the Arboretum an account of the trees of North America additional works on dendrology and descriptive botany essential to the production of that work were obtained by him. In 1892 the six thousand volumes which had by that time been accumulated were presented by the Director to the University, accommodations for a library having at that time been provided by the Arboretum.

The Arboretum Library contains the books in all editions and languages devoted to the description of trees. Its collection of Floras partly devoted to trees and monographs of genera in which trees and shrubs are described, is a large one. The collections of books and papers descriptive and cultural of various groups of plants like Conifers, Rosa, Rhododendron, Crataegus, Quercus, Salix, etc., are as nearly complete as it has been possible to make them. A complete collection of the works of Linnaeus is found in the Library; and it is believed that outside the walls of the British Museum there is not a more complete collection of the books relating to plants published in the fifteenth and sixteenth centuries. The collection of books of travel in which occur descriptions of trees or aspects of vegetation is a large and interesting one and contains a few rare volumes. Little attention has been paid to books relating to the description and care of the fruit trees usually cultivated in cold countries, for such works on pomology are found in libraries devoted to horticulture. There are, however, a large number of books relating to the history and cultivation of trees and shrubs valued for special products like tea, coffee, cocoa, oranges and their allies, cinchona, olives and the mulberry in its relation to the manufacture of silk as it has seemed desirable that this library should contain all books relating to woody plants with the exception of those which are more valuable in a purely horticultural library. There is not a complete collection of books on forestry in the Arboretum library, although it contains much that has been written on this subject especially that which is descriptive of the early efforts at forest management in the United States and Europe. Only a few books on paleobotany, vegetable pathology, physiology and entomology are now found in it. Its rapid growth in directions of more immediate importance in the arrangement and study of the collections of living plants has made it impossible to devote to these subjects the attention their importance demands. Such books will in time find a place in the library intended to furnish the best possible opportunity for the study of trees. The library is fortunate in the possession of a large number of complete sets of rare periodicals including two hundred which are now discontinued; it receives regularly the numbers of three hundred serials more or less devoted to trees and their cultivation.

In 1904 Miss Ethelyn M. Tucker joined the staff of the Arboretum to assist in the care of the library and to prepare a Catalogue of its contents. In 1918 she was appointed Librarian. The books in the library have been systematically arranged by her under the system usually followed in American libraries and are fully and completely catalogued. When Miss Tucker began in 1904 to prepare the manuscript for a printed Catalogue the library contained 10,000 volumes; when the first volume of the catalogue was printed in 1914 the number had increased to 30,000. The printed catalogue is contained in two quarto volumes. The first, which is devoted to periodicals and to authors and titles, contains 782 two-column pages, and in the second volume, which appeared in 1917 contains 542 two-column pages, the books are arranged according to subjects.

Early in the formation of the library it became evident that to build up a dendrological library and to carry on at the Arboretum a critical study of trees and other woody plants more information about the literature of trees than could be found in any printed bibliography was necessary. To meet this difficulty a plan was carefully worked out for a bibliography to contain a reference to every book, every magazine article and every paper in the Transactions of Learned Societies relating to trees or shrubs in all languages published before the end of the nineteenth century. This work was entrusted to Mr. Alfred Rehder, at that time assistant in the Herbarium, who began work on it in March 1900, and devoted his time to it until the printing of the last volume was finished. During the preparation of this book Mr. Rehder visited every library in the eastern United States in which botanical or horticultural books are found, and during two visits in Europe extending over a period of twenty-seven months studied in the botanical libraries of Great Britain, France, Spain, Denmark, Norway, Sweden, Germany, Austria, Italy and Russia. The name of this work is the Bradley Bibliography as it was partly paid for from the income of a gift made in 1897 to the Arboretum by Miss Abby A. Bradley of Hingham as a memorial to her father William Lambert Bradley. The first two volumes devoted to an enumeration of works on Dendrology, were issued in 1911, and in 1912. Volume iii. devoted to Arboriculture and the Economic Properties of Woody Plants appeared in 1915; volume iv. containing an enumeration of works on Forestry, in 1914, and the fifth and final volume, which contains the Index of Authors and Titles and a subject Index of the whole work, in 1918. The five volumes of the Bradley Bibliography contain rather more than one hundred thousand titles of books and papers relating to trees and shrubs printed on three thousand seven hundred and eighty-nine two-column quarto pages.

Other works prepared in the Library and Herbarium and published by the Arboretum are,—

The Pines of Mexico (1909) and a monograph of the Genus Pinus (1914) by Mr. George R. Shaw; The Plantae Wilsonianae (in 3 vol. 1913–17), being an account of the plants collected in western China by E. H. Wilson

for the Arboretum; The Cherries of Japan (1916) by Mr. Wilson; The Conifers and Taxads of Japan (1916) by Mr. Wilson; A Monograph of Azaleas by Messrs. Wilson and Rehder (1921); twelve volumes of the Bulletin of Popular Information (1911–22); the first three volumes of the Journal of the Arnold Arboretum (1919–22); and an illustrated Guide to the Arnold Arboretum (1911) with a second edition in 1921.

The following are some of the works which have been prepared by the Director in this library but were not published by the Arboretum: Report on the Forests of North America, being the ninth volume of the Final Reports of the Tenth Census of the United States (1884); The Woods of the United States with an account of their structure, qualities and uses (1885); The Silva of North America in fourteen volumes with seven hundred and forty plates (1891–1902); Trees and Shrubs; illustrations of new or little known ligneous plants, prepared chiefly from material at the Arnold Arboretum (1905–1913), largely by officers of the Arboretum. The ten volumes of Garden and Forest, a journal of horticulture, landscape art and forestry (1887–1897), were edited in the Arboretum library, in which Mr. Alfred Rehder has prepared the descriptions of a large part of the trees and shrubs included in Bailey's Cyclopedia of American Horticulture and in the second edition of that work, The Standard Cyclopedia of Horticulture.

PHOTOGRAPHS

The Arboretum collection of photographs now contains nine thousand six hundred pictures of trees and shrubs, types of vegetation, gardens and scenery. The photographs are mounted on cards 11¾ inches long and 9½ inches wide and are arranged systematically in steel drawers. The two thousand eight hundred pictures made by Wilson in eastern Asia and Australasia form the most valuable and interesting part of this collection. The Arboretum photographs have been carefully catalogued by Miss Tucker and can be easily and quickly examined. This collection proves to be an important and useful addition to both the Library and Herbarium.

EDUCATION

The Arboretum in the conception of its managers is a museum founded and carried on to increase the knowledge of trees. This they have endeavored to do by a collection of living plants arranged for convenient examination and study, by the distribution of surplus material obtained in the Arboretum explorations, and by the publication of the results of the dendrological investigations carried on in its laboratories. That they have been at least partly successful is shown by the standing of the Arboretum in the estimation of the men in different countries best able to judge of its usefulness.

No attempt has been made to give instruction at the Arboretum to

classes of University undergraduates. A few special students, often in recent years from China and Japan, are received by Professor J. G. Jack who for many years now has given field lessons during the spring and autumn months among the collections of trees. In the answers to the letters which come to the Arboretum, as to all museums, asking for information, help and instruction are freely given.

The Arnold Arboretum is not a School of Forestry or of Landscape Gardening. It is a station for the study of trees as individuals in their scientific relations, economic properties and cultural requirements and possibilities. On the information gathered in museums like the Arnold Arboretum successful silviculture and landscape gardening are dependent, for silviculture is the cultivation on a large scale of the trees most valuable in a particular locality, and landscape gardening demands a knowledge of the individual plants which can be naturally associated for the decoration of parks and gardens.

No account of the Arnold Arboretum is complete without mention of two remarkable men who have died in its services.

Charles Edward Faxon, one of three brothers who devoted the best part of their lives to the study of Natural History, was born in 1846 in Jamaica Plain where he died in 1918. As a boy he had begun to study the New England flora and to show his ability to draw by his copies in color of Audubon's pictures of birds. Before 1870 he had made most of the colored drawings to illustrate Eaton's "Ferns of North America"; and from 1879 to 1884 he was instructor in botany at the Bussey Institution. In 1882 when the plan was made to prepare at the Arboretum an illustrated work on the trees of North America Faxon was invited to make the drawings for it. At this time he took charge of the herbarium and library which he continued to manage until his death. His knowledge of botany, especially of the flora of eastern North America, his love of books and his remarkable faculty for learning foreign languages were of great value in the organization and care of these departments. During twenty-one years Faxon was engaged on the seven hundred and forty-four drawings which illustrate the "Silva of North America," and during his twenty-six years of service for the Arboretum nineteen hundred and twenty-four of his drawings of plants were published. To his work he brought enthusiasm, industry, good taste, a thorough understanding and love of his subjects, an unusually skilful pencil, and skill in microscopic analysis. No other American botanical artist has had his experience and industry, and no one has contributed more to the reputation of the Arboretum and the value of its publications.

Jackson T. Dawson was the first superintendent of the Arboretum and continued to fill this position and that of propagator until his death in the summer of 1916. Born in the East Riding of Yorkshire in 1841 Dawson was brought when a child to this country by his mother and when eight years old was started in gardening in an uncle's nursery in Andover, Massachusetts. He served for three years in a Massachusetts regiment during

the Civil War and was several times wounded. On his discharge from service in 1864 Dawson entered the employ of Hovey & Company of Cambridge, at that time one of the important commercial nurseries of the United States. In 1871 he was made head gardener of the School of Horticulture at the Bussey Institution by Francis Parkman, the first professor of that department in the School, a position which he filled for three years when he became superintendent of the Arboretum. Dawson had the real love for plants and an exceptional knowledge of them. As a plant propagator it is not possible that any one could have been his superior. No problem in propagation was ever too difficult for him to solve. At the Arboretum he was compelled to work in crowded quarters with insufficient appliances, and in spite of this handicap he raised for the Arboretum during his forty-two years of service probably more than a million plants, and there are now few public or private gardens in the northern hemisphere which have not been enriched by his labors. Dawson served the Arboretum faithfully and made many friends for it; and without his assistance it would have been impossible to make the collections of living plants what they are today.

FUTURE NEEDS

During its first fifty years the area occupied by the Arboretum has been increased from one hundred and twenty-five to two hundred and fifty acres. The endowment has been increased from $103,847.57 to $808,175.75, and a construction fund of $129,257 immediately available for improvements has been accumulated.

The greatest collection of the hardy trees and shrubs of the northern hemisphere has been made and arranged, and many new plants largely discovered through its explorations have been distributed.

It has established the largest and most important herbarium in the world devoted exclusively to preserving the records of trees and shrubs, and a library which within the limits of its special subjects is not surpassed. More important than these are the friendly relations it has established with the students and cultivators of trees in all parts of the world, for through these relations it will be able to increase and extend its usefulness.

In discussing the future of the Arboretum and its needs it must be remembered that during its first half century it has been managed not merely as a New England museum but as a national and international institution working to increase knowledge of trees in all parts of the world and as anxious to help a student in Tasmania or New Caledonia as in Massachusetts. An institution with such ambitions must be equipped to answer any question about any tree growing in any part of the world which may be addressed to it. During the first fifty years of the Arnold Arboretum only the foundations of such an establishment have been laid, but in laying these foundations some of the needs of the future are made clear. These are, —

First: The collection of more information about the trees in many parts of the world than can now be found here. Such information can be obtained only in small part by correspondence and the information which the Arboretum needs can only be successfully obtained by agents sent out to obtain it. It is desirable that the work which the Arboretum has begun in eastern continental Asia should be continued and if possible completed. The flora of the coastal region north of latitude 45, including Kamtschatka, is still very imperfectly known. From this region trees and shrubs, still unknown in gardens, which will grow in New England can probably be obtained. Explorations in the northern part of Kansu, the great northwest province of China, may also be expected to enrich northern gardens. The flora of China south of the Yang-tze-kiang River and east of the Poyang Lake is still little known; and the trees of Cochinchina (Tonkin, Annam and Siam) are still badly represented in the Arboretum herbarium; and Harvard College will not have fulfilled its agreement with the Arnold Trustees until it has caused to be explored through the Arboretum the forests which cover the ranges of the Altai Mountains which form the southern boundary of central Siberia and the great interior region south of these mountains.

If the Arboretum is to become a great institution for gathering and spreading information about trees and allied plants specimens and a series of photographs of every species of tree in the world should be found in its herbarium. The work which it has accomplished in its first fifty years in North America and the Japanese Empire should be extended over the rest of the world. For the trees of the tropics this is now important as tropical forests are fast disappearing to make room for plantations of rubber-producing and other economic plants. The best soil is selected for these plantations, and as with few exceptions the largest and best individuals of a species are produced in the best soil, many species, or certainly their best representatives, must disappear, and in the future the student of trees must depend for any knowledge of many trees on the material and information preserved in institutions like the Arnold Arboretum. The exploration of the tropical forests of the world will require perhaps a century and a large expenditure of money to accomplish. It is work that this Arboretum should begin and steadily push forward.

Second: The Arboretum requires a properly equipped department for the study of the diseases of trees in this country and in other parts of the world.

Third: The Arboretum requires a department in which the study of insects dangerous to trees and the methods for their control can be carried on in connection with the other investigations undertaken by the Arboretum and controlled by it.

Fourth: The Arboretum needs a department for the breeding of new races of plants. The world already owes much to the intelligence and skill of the plant breeder. He has increased the value of many farm crops and has

produced shrubs which are the chief ornament of many gardens. Less has been done in attempting to improve trees by the mixing of different species. Hybrid trees especially among Oaks often occur in this country. Several of these trees are already in this Arboretum where they grow more rapidly and are often hardier than their parents. Natural hybrids of Poplar-trees are common and often grow more rapidly than their parents; and a number of hybrid Poplars have been raised artificially in Europe and promise to become valuable trees. One of the largest, hardiest and most rapid-growing of all Elm-trees is a natural hybrid between two European species. The best Hickory-nuts are produced by trees which are natural hybrids; and one of the largest and handsomest hybrid Oak-trees in the United States has also been artificially reproduced by crossing the two species which were the parents of the natural hybrid. Judging by what little is now known about hybrid trees it does not seem improbable that new races of trees may be produced artificially which will contribute materially to the value of the forest products of the world and increase the beauty of parks and gardens. The Arnold Arboretum with its great collections and its connection with the principal cultivators of plants is now the best place for breeding new trees and shrubs in the United States. Plant breeders from all parts of the country send to it for the material needed in their work but this work can best be done here.

Fifth: A Rose Garden and a Rock Garden if planned comprehensively would add much to the horticultural value of the Arboretum, and bring many visitors to it.

Only a larger endowment is needed to make possible these Arboretum activities and extensions.

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A LIST OF THE SHRUBS OF LOUISIANA

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Just as in the list of trees of Louisiana, published in this journal April 1921, this catalogue is based almost entirely on the collections of the writer during the past sixteen years. Shrubs which occasionally become arborescent have already been catalogued in the list of trees and are not listed again here. The date of flowering has been given in most cases and is always the earliest date on which the plant was found in bloom. While it is believed that the list of shrubs is fairly complete, there is much still to find out regarding their distribution in the State. A few shrubs have been included, specimens of which were collected in 1840 by Dr. Josiah Hale, of Alexandria, and deposited in the herbarium of the new Orleans Academy of Sciences, the remains of which are now in the herbarium of Tulane University. A few have also been included on the authority of Dr. J. K. Small in his Flora of the Southern States, second edition. In addition to the specimens in Tulane University herbarium, specimens of almost all of the shrubs are in the Arnold Arboretum. As in the case of the trees Professor Sargent has revised the identifications. In some unaccountable manner, in the list of trees, the Live Oak, the best known tree in Louisiana, was omitted and is included here.

PALMACEAE.

Sabal glabra (Mill.) Sarg. (*S. Adansonii* Guerns.) In swampy ground over the whole State. Flowers April 20. Fruit July.

Serenoa serrulata (Michx.) Hook. f. Dry pine barrens and sandy soil, Washington and St. Tammany Parishes. Flowers May 5. Fruit July.

LILIACEAE.

Smilax hispida Muhl. Dry and wet woods everywhere. Flowers April 3. Fruit June.

Smilax pumila Walt. In dry woods over the whole State. Flowers April 15.

Smilax rotundifolia L. Common everywhere in woods and along fences. Flowers April 15. Fruit July.

Smilax bona-nox L. In woods and along streams. Common. Flowers April 15.

Smilax laurifolia L. In damp woods and along streams; over the whole State. Used largely for Christmas decorations. Flowers June 25. Fruit September.

Smilax Walteri Pursh. Very common on edges of cypress swamps, sometimes retaining the red berries all the winter.

Smilax lanceolata L. In woods, Washington Parish. Flowers June 15.

MYRICACEAE.

Myrica cerifera var. *pumila* Michx. Open pine woods and pine barrens, Tangipahoa, St. Tammany and Washington Parishes. Flowers March 5. Fruit May.

Myrica carolinensis Mill. Along streams in the pine barrens. East Louisiana. Flowers March 15. Fruit June.

Myrica inodora Bartram. Along streams in pine barrens, Washington Parish. Flowers February 25. Fruit June.

BETULACEAE.

Alnus rugosa (Du Roi) K. Koch (*A. serrulata* Willd.) Along streams over the whole State. Sometimes arborescent, reaching a height of 30 feet or more. Flowers February 25.

FAGACEAE.

Castanea nana Muhl. Sand hills and pine barrens forming wide patches, Louisiana; on authority of Small, Flora, ed. 2, p. 348.

LORANTHACEAE.

Phoradendron flavescens (Pursh) Nutt. All over the State on many kinds of trees.

POLYGONACEAE.

Brunnichia cirrhosa Gaertn. Moist woods and borders of cypress swamps over the whole State. Flowers April 2.

MENISPERMACEAE.

Cocculus carolinus (L.) D. C. Banks of rivers and borders of swamps over the whole State. Berries very showy and often retained the whole winter. Flowers May 2. Fruit September.

Menispermum canadense L. Banks of rivers and rich woods. West Feliciana and Washington Parishes. Fruit September.

Calycocarpum Lyoni (Pursh) Nutt. Borders of streams and edges of wet woods. West Feliciana Parish. Flowers April 15. Fruit September.

MAGNOLIACEAE.

Illicium floridanum Ellis. Rolling hills and along streams in pine barrens. East Louisiana. Most abundant in Tangipahoa, St. Tammany and Washington Parishes. Flowers February 25. Fruit May.

ANONACEAE.

Asimina parviflora (Michx.) Dunal. Partly cleared woods and dry fields. Pearl River, St. Tammany Parish, Opelousas, St. Landry Parish, and Avery Island, Iberia Parish. Flowers April 10. Fruit July.

LAURACEAE.

Benzoin aestivale (L.) Nees. Rich woods, West Feliciana Parish, also borders of swamps across the Mississippi River from New Orleans. Flowers April 1. Fruit June.

Litsea geniculata (Walt.) Benth. & Hook. Shallow ponds, Louisiana; on authority of Small, Flora, ed. 2, p. 823.

SAXIFRAGACEAE.

Hydrangea arborescens L. Ravines and borders of streams. West Feliciana, St. Tammany and Washington Parishes. Flowers May 15.

Hydrangea quercifolia Bartram. In dry woods. West Feliciana, Washington, also Richland Parish. Flowers May 25.

Decumaria barbara L. Rich woods West Feliciana, Washington and Tangipahoa Parishes. Flowers April 20. Fruit July.

Philadelphus grandiflorus Willd. Collected by Hale near Alexandria, Rapides Parish; probably an escape. Frequently planted in gardens and more or less naturalized.

Itea virginica L. Swamps and river banks over the State. Flowers April 15.

Grossularia campestris Small. Red River, Avoyelles Parish. Hale, Louisiana, 1840 in herb. Columbia University.

ROSACEAE.

Spiraea salicifolia L. Collected by Hale in 1840 near Alexandria, Rapides Parish.

Rubus villosus Ait. (*R. procumbens* Muhl.) Cultivated ground over the State. Flowers February 20. Fruit May.

Rubus floridus Tratt. Sandy ground, Natchitoches Parish (E. J. Palmer, No. 7208). April 15.

Rubus carpinifolius Rydb. Low wet woods, Rapides Parish and Natchitoches Parish. (E. J. Palmer, No. 7431). April 29.

Rubus cuneifolius Pursh. Sandy soil, St. Tammany Parish (G. Arsène).

Rubus rubrisetus Rydb. Sandy soil. Natchitoches Parish. (E. J. Palmer, No. 7431).

Rubus trivialis Michx. Waste ground over the State. March 15.

Rubus argutus Link (*R. Andrewsianus*, Blanchard). All over State borders of woods, roadsides. April 5.

Rubus ostryifolius Rydb. Near the coast, Louisiana; on authority of Small, Flora, p. 517.

Rosa carolina L. (*R. humilis* Marsh.) In dry woods over the State. April 10.

Rosa Lyonii Pursh. Woods near Natchitoches, Natchitoches Parish. (E. J. Palmer, Nos. 7960, 9428).

Rosa Treleasei Rydb. Alden Bridge, Bossier Parish; on authority of Rydberg in N. Am. Fl. XXII. 503.

Rosa bracteata Wendl. Widely naturalized over the State, in many places a most troublesome weed. Blooms all the year.

Rosa laevigata Michx. (*R. cherokeensis* Donn). Roadsides and fields. Often cultivated. April 10.

Chrysobalanus oblongifolius Michx. Dry pine barrens. Washington Parish, near Bogalusa. June 5.

Aronia arbutifolia L. In damp woods and along streams. St. Tammany Parish near Covington, Alexandria, Rapides Parish, De Ridder Beauregard Parish, and Washington Parish, near Bogalusa. March 3.

Aronia arbutifolia macrophylla (Hook.) Rehd. Along streams in pine barrens. Folsom, H. Tammany Parish. March 28.

CALYCANTHACEAE.

Calycanthus fertilis var. *nanus* (Lois.) Schelle. Dry woods near Bogalusa Washington Parish, and also near Ruston, Linclon Parish, north Louisiana. April 15.

Calycanthus floridus L. Collected by Hale near Alexandria, Rapides Parish, 1840; also near Monroe, Ouachita Parish.

LEGUMINOSAE.

Acacia Farnesiana Willd. Escaped and sometimes forming dense thickets in swampy ground near Lake Pontchartrain and in cleared fields.

Acacia angustissima (Mill.) Ktze. Natchitoches Parish (E. J. Palmer).

Prosopis juliflora var. *constricta* Sarg. Vicinity of Shreveport near the Red River, Caddo Parish.

Amorpha paniculata Torr. & Gr. Collected by Hale near Alexandria.

Amorpha fruticosa L. Along streams all over State. April 15.

Amorpha fruticosa var. *croceolanata* (Wats.) C. Schneid. Calcasieu Parish (A. Allison, No. 280); Orleans Parish (R. S. Cocks); Natchitoches Parish (E. J. Palmer, No. 7548).

Amorpha tennesseensis Shuttl. Louisiana; on the authority of Rydberg in N. Am. Fl. XXII. 32.

Amorpha canescens Pursh. Prairies of Louisiana; on the authority of Britton and Brown, Ill. Flora, ed. 2, II. 366.

Wisteria macrostachya Nutt. Rich woods over the whole State. Flowers April 15.

Daubentonia longifolia (Cav.) D.C. In marshes and wet places over the State. Very abundant in vicinity of New Orleans, also near Lake Charles, Calcasieu Parish.

RUTACEAE.

Ptelea trifoliata L. Usually a shrub three or four feet high, occasionally in West Feliciana Parish, a small tree 30 feet high. Widely distrib-

uted over the State, sometimes very abundant in open fields and pastures. Flowers April 15. Fruit July.

Ptelea trifoliata var. *mollis* Curtis. In Louisiana a medium sized shrub. Very common in the western part of the State. Flowers April 15.

EUPHORBIACEAE.

Sebastiana ligustrina (Michx.) Muell. Arg. Banks of rivers over the whole State. Flowers April 2.

ANACARDIACEAE.

Rhus canadensis Marsh. Dry woods Natchitoches, Natchitoches Parish; Alexandria, Rapides Parish; Winnfield, Winn Parish. Flowers April 15.

Rhus Toxicodendron L. Woods, fields and on fences all over the State. Flowers March 5.

Rhus quercifolia (Michx.) Steud. Over the State. Flowers March 15. Fruit June.

CYRILLACEAE

Cyrilla racemiflora L. var. *parvifolia* (Raf.) Sarg. In swamps and streams, Louisiana; on authority of Small, Flora, ed. 2, p. 730.

AQUIFOLIACEAE.

Ilex myrtifolia Walt. Swamps and in wet pine barrens over State. Flowers April 3.

Ilex Amelanchier M. A. Curtis. Very rare in Louisiana, known only from one locality. Washington Parish near Bogalusa. Along streams. Flowers April 1. Fruit May.

Ilex caroliniana (Walt.) Trelease (*I. ambigua* Chapman). Sandy woods near Natchitoches (E. J. Palmer, No. 7433). April 29, 1915.

Ilex montana Torr. & Gr. (*I. monticola* A. Gray, *I. dubia* var. *monticola* Loes.) Washington Parish, Winn Parish near Winnfield quarries, also along streams, in West Feliciana Parish. April 10.

Ilex longipes Chapm. Rich woods, and along streams, West Feliciana Parish, Washington Parish near Bogalusa. April 5.

Ilex verticillata (L). A. Gray. In wet places over the whole State. April 5.

Ilex glabra L. In pine barrens over the whole State. Often forming extensive thickets. Flowers March 6. Fruit June.

STAPHYLEACEAE.

Staphylea trifoliata L. Collected by Hale, near Alexandria, Rapides Parish, 1840. Not found by writer.

CELASTRACEAE.

Evonymus americana L. Rich woods. Covington, Clairborne Parish, East and West Feliciana Parishes, Lake Charles, Calcasieu Parish. Flowers April 10. Fruit July.

Celastrus scandens L. Occurring in Louisiana only in West Feliciana Parish where it is common. Flowers April 25. Fruit September.

RHAMNACEAE.

Berchemia scandens (Hill) K. Koch. Moist woods over the whole State. Flowers April 1, Fruit August.

Zizyphus jujuba Mill. (*Z. sativa* Gaertn., *Z. vulgaris* Lam.) Escaped from cultivation and forming dense thickets near Bains, West Feliciana Parish. Flowers April 10.

Ceanothus americanus L. Dry woods, over the State. April 15.

Ceanothus intermedius Pursh. Pine woods, widely distributed over the State. April 15.

VITACEAE.

Vitis rupestris Scheele. Woods near Natchitoches, Natchitoches Parish (E. J. Palmer No. 8006).

Vitis cordifolia Lam. Woods and thickets over the whole State. Flowers April 1. Fruit September.

Vitis palmata Vahl. Rich wet woods Richland and West Feliciana Parishes, also near Natchitoches, Natchitoches Parish. Flowers April 3. Fruit September.

Vitis cinerea Engelm. Rich woods over the State. Flowers April 3. Fruit November.

Vitis Linsecomii Buckl. Dry oak lands, Louisiana; on authority of Small, Flora, p. 755.

Vitis tiliifolia H. B. K. (*V. caribaea* D. C.) Sandy soil, Louisiana; on the authority of Small, Flora, p. 756.

Vitis rufotomentosa Small. Near Natchitoches, Natchitoches Parish (E. J. Palmer, No. 7974), and in woods, West Feliciana Parish. Flowers April 3. Fruit November.

Vitis aestivalis Michx. In rich woods. West Feliciana Parish. Flowers April 1. Fruit October.

Vitis candicans Englem. In swampy woods. Cameron Parish near the sea coast. Fruit June.

Vitis rotundifolia Michx. Rich woods over the whole State. Flowers April 2. Fruit August.

Ampelopsis cordata Michx. Borders of swamps and moist woods over the State. Flowers May 1. Fruit August.

Ampelopsis arborea (L.) Koehne. Moist woods and fields over the State. Flowers April 5. Fruit September.

Parthenocissus quinquefolia var. *hirsuta* Planch. and var. *Saint-Paulii* (Graebn) Rehd. In woods over the State. Flowers April 15. Fruit September.

Cissus incisa Desmoul. Very common near the sea coast on shores of Lake Pontchartrain. Flowers April 15.

TAMARICACEAE.

Tamarix gallica L. Extensively naturalized along the coast, frequently growing on sea beaches within the tide line. Very abundant in Cameron Parish at the mouth of Cameron River.

GUTTIFERAE.

Ascyrum stans Michx. In sandy soil. St. Tammany, Tangipahoa Parishes, also near Natchitoches, Natchitoches Parish. May 15.

Ascyrum multicaule Michx. Dry woods Shreveport, Caddo Parish, and over the whole State.

Ascyrum hypericoides L. Over the whole State. June 15.

Hypericum prolificum L. Borders of ponds. Shreveport.

Hypericum lobocarpum Gattinger. St. Tammany Parish, on banks of Chefuncte River. May 20.

Hypericum apocynifolium Small. Rich woods near Crowley, Acadia Parish. April 28.

Hypericum fasciculatum Lam. Pine barrens and dry woods over the State. April 10.

Hypericum nudiflorum Michx. Dry woods. Natchitoches Parish (E. J. Palmer, Nos. 7298, 7572, 8008, 8009). Alexandria, Rapides Parish. April 15.

Hypericum aspalathoides Willd. Sandy open ground, Chopin, Natchitoches Parish (E. J. Palmer, No. 7545). May 6.

THEACEAE.

Stewartia malacodendron L. In rolling woods, Tangipahoa, St. Tammany, Washington Parishes. May 5.

CORNACEAE.

Cornus stricta Lam. Borders of swamps over the State. April 10.

ERICACEAE.

Clethra alnifolia L. Along streams in pine barrens, St. Tammany, Tangipahoa, and Washington Parishes. April 20.

Clethra tomentosa Lam. Borders of ponds in pine barrens St. Tammany, Washington, Tangipahoa Parishes. Flowers June 25.

Rhododendron canescens Sweet (*Azalea canescens* Michx.) Over the whole State except alluvial soil and swamps. February 27.

Rhododendron canescens var. *subglabrum* Rehd. On wet sandy soil. Natchitoches, Calcasieu and East Baton Rouge Parishes.

Rhododendron serrulatum Millais (*Azalea serrulata* Small). Very rare, found only near Pearl River, St. Tammany Parish. June 15.

Leucothoe axillaris (Lam.) D. Don. In damp woods, Washington Parish near Bogalusa. April 10.

Leucothoe racemosa (L.) A. Gray. Very common in wet pine barrens and along streams.

Pieris lucida (Lam.) Rehd. (*Andromeda nitida* Bartr.) Wet pine barrens, very common over the whole State.

Lyonia ligustrina var. *foliosiflora* (Michx.) Fern. Swamps and low pine lands, Louisiana; on the authority of Small, Flora, ed. 2, p. 889. Not found by writer.

Gaylussacia dumosa (Andr.) Torr. & Gr. Sandy soil in pine barrens over the State. Flowers March 15. Fruit July.

Gaylussacia hirtella (Ait.) Klotzsch. Damp pine barrens, Washington and St. Tammany Parishes. Flowers March 15. Fruit July.

Gaylussacia frondosa (L.) Torr. & Gr. Swampy places in the pine barrens, St. Tammany and Tangipahoa Parishes.

Vaccinium virgatum Ait. In woods and along streams and on prairies over the whole State. Flowers April 15. Fruit July.

Vaccinium stamineum L. Rolling hills over the whole State. March 2. Fruit July.

Vaccinium vacillans Chapm. Rich swampy woods. Richland Parish. Flowers April 15.

Vaccinium tenellum Ait. In open pine woods over the whole State. Flowers February 28. Fruit June.

Vaccinium Elliottii Chapm. On rolling hills, West Feliciana and Winn Parishes; in pine woods over the whole State. Flowers March 3. Fruit June.

Vaccinium corymbosum L. Along streams in pine barrens. Folsom, St. Tammany Parish. Flowers April 6. Fruit July.

Vaccinium fuscatum Ait. (*V. corymbosum* var. *fuscatum* A. Gray). Swamps Louisiana; on authority of Small, Flora, ed. 2, p. 895.

Vaccinium melanocarpum Mohr. Dry open woods near Natchitoches, Natchitoches Parish. Flowers April 15. Fruit July.

Vaccinium myrsinites Lam. Pine lands, Louisiana; on authority of Rev. A. B. Langlois, Catalogue of plants of Southern Louisiana. 1887.

STYRACACEAE.

Styrax pulverulenta Michx. Wet pine barrens over the whole State. Flowers March 25.

Styrax americana Lam. Borders of swamps and along streams and bayous over the whole State. Flowers March 20.

LOGANIACEAE.

Gelsemium sempervirens L. Climbing to the tops of the highest trees. Especially common in wet pine woods over the State. February 20.

SOLANACEAE.

Capsicum baccatum L. Salt marshes near the beach, Cameron Parish. Introduced. Flowers August 15.

Lycium carolinianum Walt. In drifting sands along the sea coast and on the islands. Flowers July 3.

Lycium halimifolium Mill. (*L. vulgare* Dunal). Widely naturalized around Lake Charles. Flowers April 15.

Cestrum Parquii L'Hér. Common in waste ground in vicinity of New Orleans. Flowers April 15.

VERBENACEAE.

Callicarpa americana L. In woods everywhere throughout the State. Flowers April 15. Fruit July. Occasionally a form occurs with fruit white instead of pink.

Vitex Agnus-castus L. Widely naturalized in many parts of the State. Flowers in June.

BIGNONIACEAE.

Bignonia radicans L. Woods and fields everywhere. Flowers April to October.

Anisostichus capreolata (L.) Bur. Borders of swamps and wet woods over the whole State. Flowers April 1.

CAPRIFOLIACEAE.

Viburnum acerifolium L. In dry rolling woods. Winnfield, Winn Parish; Natchitoches, Natchitoches Parish; Shreveport, Caddo Parish. Flowers May 2. Fruit August.

Viburnum scabrellum (Torr. & Gr.) Chapm. In damp woods over the whole State. April 15.

Viburnum nudum L. In swampy woods over the whole State. Flowers April 15. In east Louisiana for several years it has flowered also in October.

Viburnum nudum var. *angustifolium* Torr. & Gr. In east Louisiana. St. Tammany and Washington Parishes.

Symphoricarpus orbiculatus Moench. Collected in 1840 by Dr. Josiah Hale, near Alexandria, Rapides Parish.

Lonicera Caprifolium L. Escaped from cultivation and naturalized.

Lonicera japonica Thumb. Escaped from cultivation and naturalized.

Lonicera sempervirens Ait. Borders of woods and along streams over the whole State. Flowers April 6.

COMPOSITAE.

Iva fruticosa L. In swamps near the coast and salt marshes. Very abundant. Flowers April 15.

Baccharis halimifolia L. In marshes both salt and fresh and in cultivated ground as a weed. Flowers September.

Baccharis angustifolia Michx. Salt marshes. Bayou Barataria, Jefferson and Plaquemine Parishes. Flowers October 15.

OMITTED FROM TREE LIST.

Quercus virginiana L. Widely distributed over the State both in sandy and alluvial soil. Most abundant near the coast.

Quercus virginiana var. *eximia* Sarg. A shrub or small tree very common in pine barrens, St. Tammany and Tangipahoa Parishes.

Crataegus araioclada Sarg. Upland woods, Natchitoches, Natchitoches Parish.

Crataegus blanda Sarg. Near Minden, Webster Parish (B. F. Bush, No. 633).

×*Gleditsia texana* Sarg. Waste ground near the Red River, Shreveport, Caddo Parish.

Zanthoxylum clava-Herculis L. Small tree in sandy soil or on river banks. Marchouse, St. Landry Parish and West Feliciana Parish.

NOTES ON NORTH AMERICAN TREES, X[1]

C. S. SARGENT

NEW SPECIES AND VARIETIES OF CRATAEGUS

Crataegus swanensis (§ Crus-galli), n. sp.

Leaves oblong-obovate, acute and short-pointed at apex, gradually narrowed and cuneate at the acute base and finely serrate above the middle with acute straight or slightly incurved teeth; fully grown when the flowers open and then glabrous above and slightly villose below along the midrib and primary veins, and at maturity thin, dull yellow-green on the upper surface, slightly paler on the lower surface, 3–5 cm. long and 2–2.5 cm. wide, with a slender midrib glabrous or slightly pubescent below and thin conspicuous veins impressed on the upper side of the leaf; petioles slender, slightly wing-margined at apex, densely villose early in the season, becoming pubescent, 5–10 mm. in length; leaves on vigorous shoots broad-obovoid to oval, often slightly lobed, more coarsely serrate, 5-6 cm. long and 3.5–4 cm. wide. Flowers opening early in June, 1.2–1.5 cm. in diameter, on long slender villose pedicels, in many-flowered globose villose corymbs; calyx-tube narrow-obconic, thickly covered with matted pale hairs, the lobes separated by wide sinuses, gradually narrowed from the base, slender, long-acuminate, laciniately glandular-serrate below the middle, slightly villose on the outer surface, densely covered with pale hairs on the inner surface; stamens 15; anthers yellow; styles 2 or 3. Fruit ripening the middle of October, on stout villose pedicels in pendent clusters, ellipsoidal or subglobose, scarlet, 1 cm. long and 8–9 mm. in diameter, the calyx little enlarged with a wide deep cavity pointed in the bottom and with spreading and reflexed persistent lobes; flesh thin, dry and mealy; nutlets 2 or 3, rounded at the ends, rounded or occasionally grooved on the back, 6–8 mm. long and 5–6 mm. wide, the narrow brown hypostyle extending to the middle.

A tree raised at the Arnold Arboretum from seeds (Seed List No. 2265) collected in 1906 by *B. F. Bush* at Swan, Christian County, Missouri, with stout branchlets densely villose early in their first season, becoming

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dark chestnut brown, lustrous and marked by pale lenticels in the autumn and dull gray-brown the following year, and armed with many stout straight or slightly curved chestnut brown spines 2–6 cm. in length.

There is unfortunately no specimen in the Arboretum herbarium from the tree from which this plant in the Arboretum was raised, and there are no notes concerning it. I venture, nevertheless, to describe it as a new species as it distinctly differs from the six species of this group previously described with pubescent corymbs and yellow anthers to which it is most closely related. Of these the four Louisiana species have thick coriaceous or subcoriaceous oblong-obovate leaves rounded or very rarely acute at apex. From *C. Mohrii* Beadle from western Georgia, central Alabama and eastern Mississippi, with obovate to rhombic usually acute leaves it differs in its larger flowers and fruit, in its densely villose corymbs and young branches, and in its more pubescent leaves. From *C. insignis* Sargent from the neighborhood of Kahokia and East St. Louis, Illinois, it differs in the shape of its less coarsely serrate leaves, smaller flowers in much more villose corymbs and smaller fruit.

Crataegus ohioensis (§ Crus-galli) n. sp.

Leaves oblong-obovate, acute and short-pointed or acuminate at apex, gradually narrowed and cuneate at base, finely and often doubly serrate usually only above the middle with straight teeth; more than half grown when the flowers open, and then glaucous below and glabrous, and at maturity thin, dark yellow-green, lustrous above, 5–8 cm. long, 1.8–4 cm. wide, with a thin midrib and slender prominent primary veins; petioles stout, grooved on the upper side, wing-margined nearly to the base, 6–10 mm. in length; leaves on vigorous shoots oblong-obovate to elliptic, rounded or acute at apex, coarsely serrate. Flowers opening from the 20th to the end of May, 1.3–1.5 cm. in diameter, on slender pedicels, in wide many-flowered slightly villose corymbs, their bracts and bractlets slender, elongated, glandular; calyx-tube narrow-obconic, glabrous, the lobes slender, acuminate, entire, glandular-villose near the apex, glabrous; stamens 20, anthers pale pink; styles 2–5. Fruit ripening at the end of September or early in October, ellipsoidal to obovoid, reddish green, dotted, 1–1.5 cm. long, 7–8 mm. in diameter, and crowned with the enlarged erect persistent calyx-lobes, the cavity deep and narrow; flesh hard and dry; nutlets 2–5, rounded at the ends, prominently ridged on the back, 5–7 mm. long, 4–5 mm. wide, the narrow dark hypostyle extending to just below the middle.

A tree sometimes 10 m. high, with a stout trunk often divided into several stems, a broad round-topped head of spreading light green branches and slender glabrous branchlets gray-green when they first appear, becoming reddish brown in their second year and armed with occasional slender nearly straight chestnut-brown lustrous spines 3–4 cm. in length, persistent and compound on old branches and trunks.

OHIO. Franklin County, roadsides near Columbus, *R. E. Horsey* and *J. H. Schaffner*, No. 2330 May 18, 1914; *E. R. Horsey*, No. 130, September 22, 1914; *E. R. Horsey*, No. 233 (type) May 14, 1915.

This tree differs from the described species of the Crus-galli Group with 20 stamens and rose colored or pink anthers in its narrow acute thin leaves, slightly villose corymbs and in the erect calyx lobes of the fruit.

Crataegus Warneri (§ Crus-galli), n. sp.

Leaves ovate to oval or obovate, rounded or acute and short-pointed at apex, gradually or abruptly narrowed and cuneate at base, and coarsely serrate above the middle with straight gland-tipped teeth, nearly fully grown when the flowers open and then covered above with short white hairs and villose below along the midrib and primary veins, and at maturity thin, dark green and glabrous or occasionally still villose on the midrib above, pale and still villose below along the slender midrib and primary veins, 3.5–5 cm. long and 2.5–3.5 cm. wide; petioles stout, wing-margined to the base, densely villose at maturity, 5–7 mm. in length; leaves on vigorous shoots broad-ovate to semiorbicular, short-pointed at the rounded or acute apex, rounded and gradually narrowed below into a broad wing extending nearly to the base of the short petiole, more coarsely serrate, subcoriaceous, roughened above, 4.5–6 cm. long and broad, with a stout midrib and primary veins villose below. Flowers opening from the 10th to the middle of April, 1–1.2 cm. in diameter, on stout densely villose pedicels in compact many-flowered villose corymbs; calyx-tube narrow-obconic, thickly covered with matted pale hairs, the lobes narrowed from a broad base, slender, acuminate, glandular-serrate, slightly villose on the outer surface, puberulous on the inner surface; stamens 10; anthers red-purple; styles 2, rarely 3. Fruit ripening late in September, on slightly villose pedicels, ellipsoidal to subglobose, orange-red, 6–9 mm. long, the calyx little enlarged with a short tube and a wide shallow cavity flat in the bottom and with spreading often deciduous lobes; nutlets 2 or 3, rounded at the ends, ridged on the back with a broad deeply grooved ridge, 4 mm. long and 3.5–4 mm. wide, the narrow hypostyle extending to the middle.

A tree 7–8 m. high, with a slender stem covered with dark bark scaly near the base, erect branches forming a narrow head, and slender branchlets red-brown and covered with pale hairs when they first appear and dull gray and glabrous in their second year, and armed with occasional stout or slender chestnut-brown spines 3–4 cm. long; or a shrub 3 or 4 m. tall.

TEXAS. Walker County, Huntsville, *E. J. Palmer*, No. 12037, May 24, 1917, April 18, 1918; *R. S. Warner*, April 12, 1918. Cherokee County, Larissa, *E. J. Palmer*, No. 13346, April 16, 1918, No. 14446, September 18, 1918. Anderson County, Palestine, *E. J. Palmer*, No. 13360 (type), No. 14445, September 17, 1918.

Extremely rare in the three stations where it has been found, this Thorn is arborescent only at Palestine where it grows in woods. In Walker

and Cherokee Counties where it grows on dry banks it is a shrub, with several stems not more than 3 m. high.

Until the stones of the fruit are examined this species might pass for one of the Macracanthae Group, although the entire absence of lobes from the leaves and the rather compact corymbs are unusual in plants of that Group. Although it is an extreme form it is now referred with some doubt to the Crus-galli Group. The species of that Group which it most resembles is *C. sublobulata* Sargent from San Augustine, Texas, which differs in its slightly lobed glabrous thicker leaves, its broader glabrous corymbs, and in its 20 stamens with pink anthers.

Crataegus poliophylla (§ Virides), n. sp.

Leaves oblong-obovate to elliptic, acute or acuminate at apex, gradually narrowed and cuneate at base, finely doubly serrate above the middle with straight teeth and usually irregularly divided toward the apex into short acute lobes; thickly covered when they unfold with white hairs longer and more abundant on the lower than on the upper surface, nearly glabrous above when the flowers open and more or less pubescent below, and at maturity subcoriaceous, glabrous, yellow-green and lustrous on the upper surface, pale on the lower surface, 3–4 cm. long and 2.5–3 cm. wide, with a prominent midrib and slender veins deeply impressed above; on leading shoots up to 6 cm. long and 4.5 cm. wide; petioles slender, deeply grooved, narrowly wing-margined toward the apex, densely villose-pubescent early in the season, becoming glabrous, 1.5–2 cm. in length. Flowers opening late in March or early in April, 1.5 cm. in diameter, in wide lax 7–15-flowered densely villose corymbs; calyx-tube broad-obconic, villose like the slender pedicels, the lobes short, gradually narrowed from the base, glandular-serrate or nearly entire, glabrous on the outer surface, slightly villose on the inner surface; stamens 20; anthers yellow; styles 4 or 5. Fruit ripening late in September, in pendent clusters, globose to short-oblong or ovoid, orange-red, 6 or 7 mm. in diameter, the calyx prominent, with a short tube, reflexed lobes and a wide shallow cavity broad in bottom; nutlets 4 or 5, rounded at apex, gradually narrowed at base, slightly grooved on the back, 3–4 mm. long, 2.5–3 mm. wide, the narrow hypostyle extending to the middle.

A tree occasionally 4 or 5 m. high, with a trunk 8–10 cm. in diameter, covered with dark rough bark, smooth ashy gray branches and slender branchlets thickly covered early in the season with long matted white hairs, becoming glabrous and ashy gray, and armed with slender straight spines 1.5–2.5 cm. in length.

Texas. Brazoria County, *B. F. Bush*, No. 11 (5D), March 27, 1901, No. 870 (59), September 21, 1901, No. 970 (5b), October 2, 1901, No. 1212 (type), March 26, 1902. Fort Bend County, thickets in drained soil, Duke, *E. J. Palmer*, No. 5083 (3a), April 2, 1914, No. 6695 (3a), October 1, 1914.

Distinct in the shape of the coriaceous leaves and in their villose covering while young, and in the villose corymbs. Two specimens collected at

Columbia by *B. F. Bush* (No. 971), October 3, 1901, with thicker and more lustrous broad-ovate leaves up to 8 cm. long and 7 cm. wide, rather larger fruit and more zigzag branchlets probably represent an extreme form of this species. Much land has been cleared in the neighborhood of Columbia in recent years and this tree has probably disappeared as various attempts to rediscover it have failed.

Crataegus stenosepala (§ Virides), n. sp.

Leaves elliptic to oblong-elliptic or obovate, acute or acuminate at apex, gradually narrowed and cuneate at base, sharply and coarsely serrate above the middle with straight teeth, and often divided toward the apex into short lobes; when they unfold deeply tinged with red and slightly pubescent, nearly fully grown when the flowers open and then roughened above by short white hairs and conspicuous below by the thick snow-white pubescence along the midrib and on the petioles, the villose primary veins and by the axillary clusters of white hairs, and at maturity glabrous, yellow-green and lustrous on the upper surface, paler on the lower surface, 3.5–5.5 cm. long and 1.5–3 cm. wide, with a thin midrib and slender primary veins impressed above; petioles 6–7 mm. in length; leaves on vigorous shoots oblong-obovate, thicker, acuminate, cuneate at base, more coarsely serrate and more deeply lobed and up to 7 cm. in length and 4 cm. in width. Flowers opening toward the end of March, 2 cm. in diameter, in wide loose 10–20-flowered slightly villose corymbs; calyx-tube broad-obconic, sparingly covered with long white ridged hairs, the lobes gradually narrowed from the base, slender, long-acuminate, minutely and irregularly serrate, glandular-ciliate, glabrous on the outer surface, obscurely ciliate on the inner surface, 7–8 mm. long; stamens 20; anthers pale yellow; styles 5. Fruit ripening early in October, ellipsoidal to slightly obovoid, on slender glabrous pedicels in drooping clusters, orange-red, 7 or 8 mm. long, 5–6 mm. thick, with thin dry flesh, the calyx with a distinct tube, spreading lobes and a deep narrow cavity pointed in the bottom; nutlets 4 or 5, rounded at base, acute at apex, only slightly grooved on the back, 7–8 mm. long and 3–4 mm. wide, the pale broad hypostyle extending to the middle.

A shrub or small tree 4–5 m. high, with stems forming large thickets, and covered with dark slightly scaly bark and slender slightly zigzag branchlets covered when they first appear with long matted white hairs, becoming glabrous and light red-brown during their first season and ashy gray in their second year, and armed with numerous nearly straight slender spines 2–4 cm. in length.

TEXAS. Fort Bend County, low well drained soil near Duke, *E. J. Palmer*, Nos. 5093 (10a) and 6701 (10a, type) April 2 and October 1, 1914.

Distinct from the species of this Group in the remarkably long slendre calyx-lobes and conspicuous when in flower from the broad band of snow white tomentum covering the under side of the lower half of the midrib of the leaves.

Crataegus abbreviata (§ Viridis), n. sp.

Leaves ovate to obovate, elliptic or suborbicular, acute or rounded and abruptly short-pointed at apex, narrowed and cuneate or rounded at base, sharply often doubly glandular-serrate usually only above the middle, and often slightly divided usually toward the apex into short acute lobes; covered above when they unfold with short white hairs and densely tomentose below, fully grown when the flowers open and then glabrous with the exception of a few hairs along the upper side of the midrib, and of small axillary tufts below, and at maturity thin, yellow-green, glabrous, and 2.5–3 cm. long and 2–2.5 cm. wide, often appearing 3-nerved by the greater prominence of the lowest pair of primary veins; petioles slender, slightly villose-pubescent early in the season, soon becoming glabrous; leaves on vigorous shoots broad-ovate to semiorbicular or elliptic, rounded or acuminate at apex, rounded or cuneate at base, often laterally lobed, 4–5 cm. long and broad. Flowers opening early in April, 1.8–2 cm. in diameter, in slightly villose compact usually 10–15-flowered corymbs crowded on the branches; calyx-tube broad-obconic, slightly villose, the lobes short, entire, often slightly villose or glabrous on the outer surface, villose on the inner surface, mostly deciduous from the ripe fruit; stamens 20; anthers yellow; styles 4 or 5. Fruit ripening early in October, on slightly villose pedicels, in lax drooping clusters, subglobose, dark red, 6–8 mm. in diameter, with thin succulent flesh, the calyx little enlarged, with a deep cavity broad in the bottom; nutlets 4 or 5, rounded at the ends, broader at the apex than at the base, slightly grooved on the back, 3–4 mm. long, the narrow hypostyle extending to the middle.

A tree 5–5.5 m. high, with a small stem and slender nearly straight branchlets slightly villose when they first appear, dark orange-brown and glabrous or nearly glabrous when the flowers open, and gray-brown in their second year, and unarmed or furnished with occasional slender straight spines 3–4 cm. in length.

Texas. Brazos County, low woods on the Brazos River, near Brazoria, *E. J. Palmer*, Nos. 5131 (4) and 6734 (4, type), April 7, and October 5, 1914.

Although there is little in the flowers and fruit or in the habit of this plant to distinguish it from some of the other Viridis species which grow in the valley of the lower Brazos River, where this Group is represented perhaps by its greatest diversity of forms, the short small leaves are so distinct in shape that until the Texas species are better known it appears necessary to treat it as a species.

Crataegus desertorum (§ Viridis), n. sp.

Leaves ovate to slightly obovate or suborbicular, acute, acuminate or rounded at apex, gradually or abruptly narrowed and cuneate at base, finely doubly serrate usually only above the middle with blunt glandular teeth, and often slightly divided into short acute lobes; covered when they unfold with short lustrous white hairs, and villose below along the midrib

and primary veins, and at maturity thin, yellow-green and slightly roughened above by short white hairs, pale and glabrous or occasionally slightly villose toward the base of the prominent midrib below, 1.5–2 cm. long and 1–1.5 cm. wide, with three or four pairs of primary veins extending to the points of the lobes, or 3-nerved from the base; petioles slender, wing-margined to the middle, densely villose early in the season, becoming nearly glabrous in the autumn, 5–6 mm. in length; leaves on vigorous shoots ovate, broad and rounded at base, acute at apex, often deeply lobed, 2–2.5 cm. long and wide. Flowers appearing after the middle of April, small, in 4- or 5-flowered lax glabrous corymbs; calyx broad-obconic, slightly villose, the lobes slender, acuminate, obscurely serrate, glabrous on the outer surface, villose on the inner surface; stamens 20; anthers pale yellow; styles 4 or 5. Fruit ripening the middle of October, subglobose, orange-red, 4–5 mm. in diameter, with thin dry flesh; the calyx enlarged and prominent, with erect or spreading glabrous lobes and a wide shallow cavity broad in the bottom; nutlets 4 or 5, rounded and rather broader at apex than at base, only slightly grooved on the back, 4 mm. long and 2.5–3 mm. wide, the broad pale hypostyle extending to below the middle.

A shrub 3 m. high, with stems covered with thin pale bark flaky near their base, and slender unusually zigzag branchlets red-brown and slightly villose when they first appear, soon glabrous, ashy gray at the end of their first season and horribly armed with many slender straight or slightly curved chestnut-brown ultimately gray spines 2.5–5 cm. in length.

TEXAS. Uvalde County, in the rocky bed of a creek usually dry, but flooded during a few hours two or three times during the year, near Uvalde, *E. J. Palmer*, Nos. 11348, 12379 (type), 12973, March 22, June 17, October 12, 1917; Nos. 13322, 13498, 13699, 14496, April 6, May 5, May 26, September 24, 1918.

In its unusually zigzag branches, numerous long slender spines and minute fruit this is perhaps the most distinct species of the Viridis Group. The fact that it inhabits a region of rare rainfall where the soil in which it grows is only thoroughly wet two or three times in the year would be remarkable for any species of Crataegus; it is the more remarkable for a species of this Group, for the Viridis, growing usually in low ground, are moisture loving plants. It is unfortunate that Mr. Palmer has been able to find only a single plant.

Crataegus tripartita (§ Viridis), n. sp.

Leaves usually elliptic, acute or acuminate at apex and gradually narrowed to the cuneate base, or rarely ovate or obovate and broad-cuneate or rounded at base, finely serrate above the middle with straight or slightly incurved teeth, rarely slightly lobed, often furnished below early in the season with axillary tufts of snow-white pubescence, otherwise glabrous, subcoriaceous, yellow-green, lustrous above, 3–4 cm. long, 1.5–2.5 cm. wide, with a thin midrib and slender prominent veins deeply impressed on the upper surface; petioles slender, narrowly wing-margined

often to below the middle, 1–2 cm. in length; leaves on vigorous shoots broad-ovate, rounded, truncate, or abruptly cuneate at the wide base, often 3-lobed by narrow sinuses extending nearly to the midrib, the terminal lobe often lobulate, coarsely glandular-serrate, conspicuously reticulate-venulose with a vein often extending to the bottom of a sinus, 3–4 cm. long and 2–3 cm. wide, their petioles stout, wing-margined, glandular, 1–1.5 cm. in length. Flowers opening late in March, 1.5–2 cm. in diameter, on slender glabrous pedicels, in small 7–10-flowered corymbs closely set on the branches; calyx-tube abruptly enlarged upward, glabrous, the lobes gradually narrowed from a broad base, acuminate, entire, glabrous, usually deciduous from the fruit; stamens 20; anthers pale yellow; styles 5. Fruit ripening after the middle of September, short-oblong, yellow-green, 7–10 mm. long and 5–8 mm. wide, with soft succulent flesh, the calyx little enlarged, with a deep narrow cavity; nutlets 5, acute at ends, only slightly grooved on the back, 3–4 mm. long, the narrow hypostyle extending to the middle.

A shrub with several stems, 3–3.5 m. tall, or a round-topped tree 6 or 7 m. high, with dark gray scaly bark, and slender straight or slightly zigzag glabrous branchlets dark reddish brown when they first appear, becoming lighter-colored at the end of their first season, and ashy gray the following year, and armed with occasional slender nearly straight chestnut brown spines 2–3 cm. in length.

Texas. Brazoria County, low woods along the Brazos River, near Columbia, *B. F. Bush*, No. 948, September 30, 1901, No. 2, March 24, 1909 *E. J. Palmer*, No. 5040 (5), March 27, 1914, September 28, 1914 (type), No. 5102 (8), April 4, 1914, No. 6688 (8), September 30, 1914.

Distinct in the subcoriaceous leaves, those on vigorous branchlets often deeply 3-lobed with lobes coarsely glandular serrate to the base, and in its yellow-green fruit.

Crataegus anamesa (§ Virides), n. sp.

Leaves elliptic to broad-ovate or slightly obovate, acute at apex, gradually or abruptly narrowed and cuneate at base, finely serrate with short broad teeth, and often slightly divided above the middle into broad rounded lobes; when they unfold tinged with red, and villose above and thickly covered below with matted white hairs, not more than half grown when the flowers open and then glabrous or nearly glabrous above, sparingly villose and conspicuous below by the broad band of snow-white hairs along the lower part of the midrib, and at maturity subcoriaceous, nearly glabrous, dark green and lustrous on the upper surface, pale on the lower surface, 3–5 cm. long and 3–5 cm. wide; petioles slender, densely villose early in the season, becoming glabrous, 1.5–2 cm. in length; leaves on vigorous shoots broad-ovate, rounded or acute at apex, rounded or broad-cuneate at base, finely serrate, slightly lobed with short broad lobes, up to 6 or 7 cm. long and wide, their petioles stout, slightly wing-margined at apex, often furnished with occasional glands, 2.5–3 cm. in

length. Flowers appearing at the end of March or early in April, 2–2.5 cm. in diameter, in compact mostly 10–15-flowered densely villose corymbs crowded on the branches; calyx-tube narrow-obconic, glabrous except for occasional short white hairs, the lobes gradually narrowed from the base, entire or rarely minutely dentate, glabrous on the outer surface, villose on the inner surface, mostly deciduous from the ripe fruit; stamens 20; anthers pale yellow; styles 4 or 5. Fruit ripening early in October, on nearly glabrous pedicels, in few-fruited drooping clusters, subglobose to short-oblong or slightly obovoid, dark red, 9–10 mm. in diameter, the calyx little enlarged, with a narrow deep cavity pointed in the bottom; nutlets 4 or 5, narrowed and rounded at the ends, only slightly grooved on the back, about 5 mm. long, the dark narrow hypostyle extending to below the middle.

A shrub 4–5 m. high, with stems covered with gray slightly scaly bark, small erect smooth dark gray branches and slender slightly zigzag branchlets densely covered with white hairs early in the season, becoming glabrous and dull reddish brown by autumn, and dark gray the following year and apparently without spines.

TEXAS. Fort Bend County, Duke, *E. J. Palmer*, Nos. 5090 (8) and 6698 (8), April 2 and October 1914 (type).

The size of the fruit of this species is intermediate between that of typical *C. viridis* Linnaeus and that of a small group of species with fruit from 1.5–2 cm. in diameter of which *C. nitida* Sargent is the best known. Although much more pubescent, this Texas shrub resembles in the shape of its leaves another of the large-fruited Virides species, *C. atrorubens* Ashe of East St. Louis, Illinois.

Crataegus antiplasta (§ Virides), n. sp.

Leaves ovate to elliptic or semiorbicular, acute or rounded at apex, cuneate at base, finely doubly serrate above the middle with straight teeth, dark red and covered with short white hairs when they unfold, almost fully grown when the flowers open and then nearly glabrous above and slightly villose along the midrib and primary veins below, and at maturity thin, dark green and glabrous on the upper surface, paler and glabrous or still villose on the midrib and veins below, 3–4 cm. long and 2–3 cm. wide, with veins slightly impressed above; petioles slender, slightly wing-margined at apex, villose early in the season, becoming glabrous, 1–1.5 cm. in length; leaves on vigorous shoots ovate to suborbicular, acute at apex, rounded or cuneate at base, more coarsely serrate, sometimes slightly 3-lobed by narrow sinuses, up to 5 or 6 cm. long and 3–4 cm. wide, their petioles stout, broadly wing-margined nearly to the middle, occasionally glandular, often sparingly villose through the season, 8–10 mm. in length. Flowers opening late in March or early in April, 2.5 cm. in diameter, in compact glabrous mostly 5–10-flowered corymbs; calyx-tube narrow-obconic, glabrous, the lobes gradually narrowed from a broad

base, slightly dentate, glabrous on the outer surface, villose on the inner surface, usually deciduous from the ripe fruit; stamens 20; anthers pale yellow; styles 4 or 5. Fruit ripening early in October, subglobose, scarlet, 7–8 mm. in diameter, with thin dry flesh, the calyx little enlarged, with a wide deep cavity broad in the bottom; nutlets 4 or 5, rounded at the ends, rather broader at apex than at base, only slightly grooved on the back, the wide hypostyle extending to the middle.

A tree 4–5 m. high, with a slender stem covered with close gray bark, separating into small scales, erect dark gray branches and slender straight or slightly zigzag branchlets thickly covered when they first appear with matted white hairs, becoming glabrous and reddish brown in their first season and ashy gray the following year, and armed with numerous nearly straight or slightly curved ashy gray spines, 2–3.5 cm. in length.

Texas. Fort Bend County, rich prairies near Duke, *E. J. Palmer*, Nos. 5082 (3) (type), and 6894 (3).

From related species this little tree can be distinguished by the often nearly orbicular or occasionally slightly 3-lobed leaves on vigorous branchlets and by the small loosely attached scales of the bark of the trunk.

Crataegus antimima (§ Virides), n. sp.

Leaves ovate, elliptic or rarely obovate, acute or acuminate at apex, abruptly or acutely cuneate at base, finely doubly serrate above the middle with straight teeth and slightly lobed with acute lateral lobes; covered above when they unfold with short caducous white hairs and usually furnished below with axillary tufts of white pubescence, and at maturity thin, yellow-green and lustrous on the upper surface, dull and paler on lower surface, 3–4 cm. long and 2.5–3 cm. wide, with a thin midrib and primary veins impressed above; petioles slender, slightly wing-margined at apex, thickly coated until after the flowers open with matted white hairs, becoming glabrous, 5–12 mm. in length; leaves on vigorous shoots oblong to ovate or obovate, more coarsely serrate and usually more deeply lobed, up to 6–7 cm. long and 4–4.5 cm. wide. Flowers opening late in March or early in April, 2 cm. in diameter, in small compact usually 7–12-flowered glabrous corymbs; calyx-tube broad-obconic, glabrous, the lobes abruptly narrowed from a broad base, slender, acuminate, entire, glabrous, often deciduous from the ripe fruit; stamens 20; anthers pink, styles 5, surrounded at base by a conspicuous ring of white tomentum. Fruit ripening early in October, on slender pedicels in drooping clusters, subglobose to slightly obovoid, dark orange-red, 7–8 mm. in diameter; with thin soft flesh, the calyx little enlarged, with a narrow cavity not contracted in the bottom; nutlets 5, rounded at the ends, broader at apex than at base, only slightly grooved on the back, 4–5 mm. long, 2.5–3 mm. wide, the narrow hypostyle extending to the middle.

A shrub 4–5 m. high, with stems covered with dark slightly scaly bark, small erect dark gray branches, and slender nearly straight branchlets

thinly covered when they first appear with matted pale hairs, soon glabrous, reddish brown during their first season, becoming ashy gray and unarmed or occasionally furnished with short slender straight spines sometimes becoming compound on main stems.

TEXAS. Fort Bend County, near Duke, *E. J. Palmer* Nos. 5092 (10) and 6700 (10), April 2 and October 1, 1914 (type).

This species, which resembles *C. poliophylla* Sargent of the same general region in the shape of the leaves and in the size of the flowers, differs from it in the nearly entire absence of pubescence which is so conspicuous on *C. poliophylla*, and in the pink not yellow anthers

Crataegus sutherlandensis (§ Viridis), n. sp.

Leaves ovate, acute at apex, gradually or abruptly narrowed and concave-cuneate at base, coarsely doubly serrate with straight or incurved acuminate teeth; coated with pale pubescence when they unfold, soon glabrous, fully grown when the flowers open, and at maturity thin, dull yellow-green, slightly scabrate on the upper surface, 3–4 cm. long and 2–2.5 cm. wide, with a thin midrib and slender primary veins slightly raised on the upper surface; petioles slender, slightly wing-margined, sparingly villose early in the season, soon glabrous, 8–15 mm. in length; leaves on vigorous shoots rounded at base, often irregularly divided into short wide lateral lobes, 4–5 cm. long and broad. Flowers opening late in March, 2 cm. in diameter, on long slender glabrous pedicels, in lax usually 7–10-flowered corymbs; calyx-tube narrow-obconic, glabrous, the lobes slender, acuminate, often laciniately divided near the base into glandular teeth, glabrous on the outer surface, villose-pubescent on the inner surface; stamens 20; anthers faintly tinged with pink; styles 5. Fruit ripening the end of September, subglobose, often truncate at base, orange-red, 7–8 mm. in diameter, the calyx prominent, with erect and spreading lobes and a narrow deep cavity; nutlets 5, rounded at apex, acute at base, obscurely grooved on the back, 5–6 mm. long, 3–4 mm. wide, the broad conspicuous hypostyle extending nearly to the base.

A slender tree 4 or 5 m. high, with a trunk covered with dark gray bark separating freely into long thin oblong flakes disclosing the red inner bark, erect and spreading branches, their bark smooth and gray, and slender slightly zigzag branchlets orange-green and sparingly pilose above when they first appear, soon red-brown and glabrous, and ashy gray in their second season, often unarmed or furnished with occasional straight slender spines up to 5 cm. in length.

TEXAS. Wilson County, rich upland woods on the Cibalo River, near Sutherland Springs, *B. Mackensen*, No. 3, March 27, 1910, No. 257, September 28, 1913; *C. S. Sargent*, Nos. 6 and 7, March 30, 1913; *E. J. Palmer*, No. 9206 (No. 3), March 17 and 30, 1916, No. 9300 (No. 3), March 30, 1916, No. 10805 (No. 3), September 23, 1916, No. 9291 (No. 3a), March 30, 1916, No. 9292 (4), March 30, 1916, No. 10799 (4), September 25, 1916 (type), No. 9293 (4a), March 30, 1916, No. 10800 (4a), September 25, 1916, No. 9295 (4b), March 30, 1916

No. 10802 (4b), September 25, 1916, No. 10798 (3a), September 25, 1911, No. 9307 (6), March 30, 1916, No. 10812 September, 25, 1916.

Crataegus sutherlandensis var. **spinescens** Sarg., n. var.

Differing from the type in its rather smaller leaves more pubescent early in the season and often furnished below with conspicuous tufts of white axillary hairs, and in its larger and more numerous spines.

A shrub or small tree 4–5 m. high, forming thickets of slender stems covered with dark scaly bark separating in small narrow scales, slender zigzag branchlets armed with many slender straight spines from 3–6 cm. in length.

Texas. Wilson County, low woods near Sutherland Springs, *C. S. Sargent* April 8, 1915; *E. J. Palmer*, Nos. 9294 and 10801 (5), March 30 and September 25, 1916 (type), No. 9308 and 10816 (5a) March 30 and September 25, 1916.

Crataegus caerulescens (§ Pruinosae), n. sp.

Leaves glabrous, acuminate at apex, broad-cuneate to rounded at base, deeply laterally lobed with acuminate lobes, and finely doubly serrate with straight or slightly incurved gland-tipped teeth; thin and fully grown the end of May, and at maturity thick, dark blue-green and dull on the upper surface, pale blue-green on the lower surface, 4–4.5 cm. long and 3–3.5 cm. wide, with a thin prominent midrib and slender primary veins extending to the points of the lobes; petioles slender, furnished with occasional glands, 1–1.5 cm. in length; leaves on vigorous shoots often truncate at base and 4 cm. long and broad. Flowers opening the end of May, 1.8–2 cm. in diameter, on long slender pedicels in small compact corymbs with narrow glandular-serrate bracts and bractlets; calyx-tube broad-obconic, the lobes short, narrowed from a wide base, acuminate, glabrous; stamens 18–20; anthers white; styles 4 or 5. Fruit erect on slender pedicels, ripening in October, obovoid, gradually narrowed from near the top to the acute base, dull red covered with a glaucous bloom, 1 cm. long and 7–8 mm. in diameter, the calyx little enlarged with a short tube, a wide shallow cavity broad in the bottom, and spreading and reflexed persistent lobes; nutlets 4 or 5, rounded at apex, gradually narrowed and acute at base, 8–9 mm. long and 3 mm. wide.

A plant with a single stem, now almost 3 m. high with slender nearly straight glabrous branchlets yellow-green when they first appear, becoming light red-brown at the end of their first season and dull gray-brown the following year, and armed with numerous slender straight or slightly curved chestnut brown spines 3–4.5 cm. in length.

Arnold Arboretum No. 4572 (type), September 27, 1912, May 27, 1919. A plant brought to the Arboretum by *C. E. Faxon* from Orient Heights, Breeds Islands, Boston Harbor in the autumn of 1899.

This plant is peculiar in the blue color of the leaves. It is most closely related to *C. Porteri* Britton from Tannersville and Stroudsburg, Pennsylvania, a species also with blue leaves, 20 stamens and white anthers, but

the leaves of that species are all acutely cuneate at base, thicker and lustrous on the upper surface, the flowers are larger in usually fewer-flowered corymbs, and the fruit is less gradually narrowed to the base with a narrow cavity pointed in the bottom, and droops on more slender pedicels. *C. Porteri* as it grew in 1908 in the woods in low undrained soil in the neighborhood of Tannerville was a slender shrub about 5 m. high.

Crataegus ellipticifolia (§ Pruinosae), n. sp.

Leaves elliptic, acute at the ends, divided above the middle into short acute lobes, and finely often deeply serrate often to below the middle with acute glandular teeth; covered above when they unfold with short white hairs, becoming glabrous, and at maturity thin, smooth and yellow-green on the upper surface, paler below, 4–5 cm. long and 2.5–3.5 cm. wide, with a slender midrib and primary veins; petioles slender, glabrous, 2–3 cm. in length; leaves on vigorous shoots often broad-ovate, rounded or truncate at base, occasionally deeply lobed, more coarsely serrate, 4–6 cm. long and 4–5 cm. wide. Flowers opening late in May, 1–1.2 cm. in diameter, on long slender pedicels, in mostly 7–9-flowered slightly villose corymbs with long slender conspicuous bracts and bractlets; calyx-tube narrow-obconic, glabrous, the lobes gradually narrowed from a broad base, slender, acuminate, entire or rarely furnished with an occasional tooth, glabrous; stamens 20; anthers small, creamy white; styles 5. Fruit ripening early in October, short-oblong to subglobose, only slightly angled, hard, turning dull red at maturity, about 1 cm. in diameter, the calyx only slightly enlarged with a short tube, spreading closely appressed lobes, and a deep narrow cavity rounded in the bottom; nutlets broad and rounded at base, narrower and often acute at apex, prominently ridged on the back with a deeply grooved ridge, 5–6 mm. long and 3.5–4.5 mm. wide, the narrow-pale hypostyle extending to below the middle.

A shrub forming thickets with slender slightly zigzag glabrous branchlets, yellowish green early in their first season, becoming light red-brown, and armed with slender nearly straight chestnut-brown spines persistent and often compound on old stems.

Ohio. Delaware County, in pastures, near Delaware, *E. R. Horsey*, No. 123, September 25, 1913, No. 231 (type), May 27 and September 25, 1914.

From other Pruinosae with leaves covered above while young with short white hairs, flowers with 20 stamens and white or yellow anthers this species differs in its elliptic leaves.

Crataegus mariettensis (§ Pruinosae), n. sp.

Leaves oblong-ovate, acuminate, rounded or truncate at base, slightly divided into three or four pairs of short broad acute lobes, and coarsely doubly serrate with straight glandular teeth; tinged with red and covered above by white hairs when they unfold, nearly glabrous when the flowers open, and at maturity thin, yellow-green, smooth and glabrous above,

paler below, 6–7 cm. long and 4–5 cm. wide, with a slender midrib and primary veins; petioles slender, glabrous, occasionally glandular, 2.5–3 cm. in length; leaves on vigorous shoots, broad-ovate, rounded, truncate or cordate at base, more deeply lobed and more coarsely serrate, 5–6 cm. long and broad, with petioles only 1.5–2 cm. long. Flowers opening about May 20, 1.5–1.7 cm. in diameter, on slender pedicels, in small compact mostly 4–7-flowered glabrous corymbs with coarsely glandular-serrate bracts and bractlets; calyx-tube broad-obconic, glabrous, the lobes separated by wide sinuses, short, broad, acuminate, tipped with a dark gland, entire or obscurely glandular-serrate, glabrous; stamens 10; anthers pink, styles usually 5. Fruit ripening early in October, subglobose but broader than high, flattened at the ends, hard, green, 1–1.2 cm. in diameter, the calyx sessile with a shallow cavity 5 or 6 mm. in diameter, the lobes deciduous; flesh thin, hard and dry, nutlets 5, rounded at the ends, slightly grooved on the back, 4 or 5 mm. long and wide, the pale hypostyle nearly covering their inner faces.

A tree 6 or 7 m. high, with a single small trunk covered with dark gray bark, separating near the base in loose scales, ascending branches forming an open head, and stout slightly zigzag glabrous branchlets light yellow-green when they first appear, becoming dark chestnut-brown, marked by pale lenticels and armed with numerous stout nearly straight dark chestnut brown spines persistent and becoming compound on the trunk and large branches.

Ohio. Washington County, near Marietta, *R. E. Horsey*, No. 602 (type), May 20 and September 30, 1917.

From the other species of this group already described with depressed globose fruit and a red shallow fruit calyx, this new species differs in the shape of the leaves which are not cuneate at base as in those species, but broad and rounded or truncate.

Crataegus uvaldensis (§ Molles), n. sp.

Leaves ovate, acute and short-pointed at apex, concave-cuneate at base, slightly or on leading shoots more deeply lobed usually only above the middle with short acuminate lobes, and deeply doubly serrate often nearly to the base with slender acuminate gland-tipped teeth, covered above when they unfold with short ridged pale hairs and pale and villose below especially along the midrib and primary veins, and at maturity thin, dark dull green and scabrate on the upper surface, pale and nearly glabrous on the lower surface, 4–5 cm. long and 3–3.5 cm. wide, with a slender slightly villose pale yellow midrib and primary veins; petioles slender, slightly wing-margined at the apex by the decurrent base of the blade, thickly covered early in the season with matted pale hairs, becoming pubescent, 6–15 mm. in length; leaves on vigorous shoots more deeply sometimes 3-lobed with large foliaceous coarsely and sharply serrate stipules. Flowers opening early in April, about 1 cm. in diameter, on

slender villose pedicels in small compact mostly 5–7-flowered corymbs, densely villose like the narrow obconic calyx-tube; calyx-lobes slender, acuminate, entire or minutely and irregularly glandular-serrate, pubescent on the outer surface, densely villose on the inner surface, deciduous from the ripe fruit; stamens 5–10; anthers yellow; styles 3–5. Fruit ripening early in October, on more or less densely villose erect pedicels in small clusters, globose, bright red, 1–1.4 cm. in diameter, slightly pubescent with a ring of white hairs surrounding the little enlarged calyx composed of a short tube and a deep narrow cavity pointed in the bottom, flesh thick and dry; nutlets 3–5, gradually narrowed and rounded at the ends, slightly ridged on the back, 4–5 mm. long and 3–4 mm. wide, the broad conspicuous hypostyle extending to below the middle.

A shrub 3–4 m. high, with a stem covered with thin scaly bark, and slender nearly straight branchlets thickly covered when they first appear with matted pale hairs, light orange-brown and slightly hairy at the end of their first season and ashy gray and glabrous the following year, and armed with numerous slender straight gray spines 3–5 cm. long.

Texas. Uvalde County, foot of the bluff of the Sabinal River, Utopia, *E. J. Palmer*, No. 11525, April 10, 1917, No. 12946 (type), October 7, 1917. Menard County, low woods on the San Saba River, Menard, *E. J. Palmer*, No. 11889 (sterile branches only), May 12, 1917.

Distinct from the northern species of the Mollis Group in its small leaves, flowers and fruit and shrubby habit, this Texas shrub changes earlier conceptions of this Group.

Another species of the Mollis Group from western Texas with generally smaller less sharply serrate more pubescent leaves, flowers with 5–10 stamens, and rose-purple or pink anthers, and smaller fruit covered early in the season with short pale hairs but without the ring of white hairs at the base of the calyx with a wide shallow cavity and persistent lobes, is until that species is better known referred to *C. Greggii* Eggleston from the neighborhood of Saltillo, Cohuila, Mexico. As this species grows in Texas it is a tree 12 feet high which has been found on the bluffs of the Guadalupe River below Kerrville, Kerr County, *B. Mackensen*, No. 7, May 1, 1910, No. 1, April 13 and September 21, 1913, No. 2, April 13, 1913, No. 253, September 21, 1913, No. 4, September 21, 1913, No. 20 (same tree as No. 4), April 21, 1914; *E. J. Palmer*, No. 9922 (1), May 29, 1916, No. 10882, October 2, 1916, No. 11497, April 8, 1917.

A specimen with immature fruit collected by *E. J. Palmer* (No. 10169) on the bank of the Frio River near Leaky, Real County, June 11, 1916, and a specimen collected by him (No. 10899) at Junction, Kemble County, October 6, 1916, are also doubtfully referred to *C. Greggii*.

Crataegus rotundifolia var. **aboriginum** (§ Rotundifoliae), n. var.—*Crataegus aboriginum* Sargent in Rhodora, v. 164 (1903).

Differing from *C. rotundifolia* Moench in its large obovate or ovate leaves acute or rounded at apex, up to 7–10 cm. long and 5–8 cm. wide,

in its flowers 2 cm. in diameter, in its slightly villose corymbs, and in its larger fruit up to 1.5 cm. in diameter, with a more prominent calyx with often erect lobes.

The description of *C. aboriginum* was based on a single individual found by Mr. J. G. Jack at Caughnawaga in the Province of Quebec in 1899 and 1890; it has since been collected at other stations, and a further acquaintance with this plant shows by intermediate forms that it cannot be distinguished specifically from *C. rotundifolia*. The larger leaves, flowers and fruit, and the slightly villose pedicels of the most of plants examined make it, however, desirable to distinguish it as a variety.

The original plant of *C. aboriginum* was a shrub with stems only 3 m. high; the plants of St. Annes de Bellevue are trees from 7–8 m. tall. The following additional specimens are referred to this variety.

CANADA. Province of Quebec, Caughnawaga, *J. G. Jack*, No, 97, September 24, 1900, St. Annes de Bellevue, near Macdonald College, *J. G. Jack*, Nos. 207 and 208, September 23, 1913, May 30, 1914; La Tortue, *Brother M. Victorin*, October 1920; Hill County, *J. Dunbar*, Nos. 172 and 187, September 18, 1915. Province of Ontario, Gananoque, *J. Dunbar*, No. 18, June 11 and September 27, 1907, No. 66, September 1911, Belleville, *J. Dunbar*, No. 62, June 3, 1908, and September 26, 1907, Kingston, *J. Dunbar*, No. 128, October 14, 1912, June 1, 1913.

Crataegus rotundifolia f. **rubescens**, n. forma.

Differing from the type only in the distinctly red color of the leaves in spring and summer.

CANADA. Province of Quebec, St. Anne, Montreal Island, *J. G. Jack*, No. 202 (type), May 29 and September 23, 1913, Baie d'Urfe Station, G. T. R. R., *J. G. Jack*, No. 206, September 23, 1913, No. 215, May 30 and September 25, 1914,

Plants raised at the Arboretum from the seed of No. 215 have retained the red color of their leaves.

Crataegus mercerensis (§ Rotundifoliae), n. sp.

Leaves obovate to rarely ovate or semiorbicular, acute and short-pointed at apex, concave-cuneate at the entire base, usually slightly divided above the middle into short acute lobes, finely often doubly serrate with straight gland-tipped teeth, thin, glabrous, smooth and dark yellow-green on the upper surface, pale on the lower surface, 4–6 cm. long and 3–4 cm. wide, with a thin midrib and slender veins running to the points of the lobes; petioles slender, narrowly wing-margined at apex, often furnished with occasional glands, sparingly villose on the upper side early in the season, soon glabrous, 1–2 cm. in length. Flowers appearing from the middle to the end of May, about 1 cm. in diameter, on slender glabrous pedicels in 5–12-flowered glabrous compact corymbs with lanceolate to linear glandular caducous bracts and bractlets; calyx-tube narrow-obconic, glabrous, the lobes abruptly narrowed from a wide base, short, serrate toward the acute or rarely 3-lobed apex, glabrous on the outer surface, slightly villose on the inner surface; stamens 10; anthers white; styles usually 3. Fruit ripening the end of September, on erect pedicels

in few-fruited clusters, subglobose to short-oblong, orange-red, 1–1.2 cm. in diameter, the calyx little enlarged with a wide deep cavity pointed in the bottom and spreading and appressed lobes; flesh thick, dry and mealy; nutlets usually 3, rounded at the ends, broader at the apex than at the base, rounded and ridged on the back, about 5 mm. long and 3 mm. wide, the narrow hypostyle extending nearly to the middle.

A shrub with stems 3–4 mm. high, and slender nearly straight glabrous unarmed branchlets bright yellow-green early in their first season, becoming light red-brown and grayish brown in their second year.

WEST VIRGINIA. Mercer County, roadside between Princeton and Mercer Springs, *T. G. Harbison*, No. 22 (type), May 25 and 26, 1914; No. 40, September 28, 1914.

This species in general appearance looks very distinct from the typical species of this group, but its relationship is suggested by *C. dacrioides* Sargent from Obisonia, Huntington County, southern Pennsylvania, another extreme form of Rotundifoliae from which it differs in its broader obovate to ovate nearly rhombic leaves destitute of hairs on the upper surface while young and smooth at maturity, smaller flowers on glabrous pedicels, by the subglobose or short-oblong not obovoid fruit and by the absence of thorns. The absence of thorns from the specimens collected by Mr. Harbison is, however, probably not a constant character.

Crataegus meiophylla (§ Rotundifoliae), n. sp.

Leaves ovate to slightly obovate, rounded or acute at apex, cuneate at base, divided above the middle into three or four pairs of short broad rounded or acute bluntly toothed lobes, roughened above when they unfold by short white hairs, and glabrous or furnished below along the midrib and veins with occasional hairs; nearly fully grown when the flowers open, and at maturity thin, glabrous, dark yellow-green above, paler below, 2–2.5 cm. long and 1.5–2 cm. wide, with a thin prominent midrib and slender veins running to the points of the lobes; petioles slender, narrow, wing-margined to below the middle, 5–10 mm. in length; leaves at the end of vigorous shoots sometimes broad-elliptic, acute at ends, divided into acute lobes, and 4–5 cm. long and wide; petioles up to 1.5 cm. in length. Flowers appearing about May 20, 1.5 cm. in diameter, on slender pedicels in small lax slightly villose mostly 7–10-flowered cormybs; calyx-tube broad-obconic, villose, with occasional white hairs, the lobes separated by wide sinuses gradually narrowed from the base, short, acute entire or slightly or irregularly toothed, glabrous on the outer surface, villose on the inner surface; stamens 20; anthers dark rose color; styles 3–5. Fruit ripening the end of September, in drooping glabrous clusters, subglobose, dark red, 1 cm. in diameter, the calyx little enlarged with a narrow deep cavity rounded in the bottom, and spreading closely appressed lobes often deciduous from the ripe fruit; nutlets 2–4, rounded at the ends, rounded and slightly ridged on the back, 6–7 mm. long and 4–5 mm. wide, the narrow pale hypostyle extending for a third of their length.

A shrub up to 4 m. high, with stems covered with dark bark, thin gray branches armed with many slender straight or slightly curved spines 3–4 cm. long, persistent and becoming compound on old stems, and slender yellow-green glabrous branchlets.

Ohio. Harding County, Mt. Victory, *R. E. Horsey*, No. 358 (type), May 19 and September 24, 1915.

From the three other species of this group with more or less villose corymbs, twenty stamens and red or rose-colored anthers this new species differs in the shorter often rounded lobes of the much smaller leaves, shorter petioles, smaller and less villose corymbs, and in its globose not short-oblong fruit.

Crataegus Margaretta var. **Brownii** (§ Rotundifoliae), n. var.—*Crataegus Brownii* Britton in Bull. N. Y. Bot. Gard. i. 447 (1900).

Differing from the type in its usually narrow-oblong-obovate to elliptic leaves with acute lobes and smaller flowers and fruit.

The leaves of the type of *C. Margaretta* Ashe as it grows in the neighborhood of St. Louis, Missouri, are ovate, rounded at apex, broad-cuneate or rounded at base with short rounded lobes, and about as long as wide; the expanded flowers vary from 1.5–2 cm. in diameter, and the short-oblong fruit is about a centimeter in length. In Missouri, especially in the southern part of the state, trees occur with the typical leaves of the species growing with trees with sharply lobed leaves and smaller flowers and fruit. In northeastern Missouri, trees with broad and with narrow elliptic leaves occur in the neighborhood of Hannibal, and eastward the form with narrower acutely lobed leaves and smaller flowers and fruit is the more abundant. In the region east of the Mississippi River I have seen the typical form only from London, Ontario, from Downer's Grove, Illinois, from Lansing, and Vicksburg, Michigan, from Columbus, Mt. Victory and Delaware, Ohio, from Grant, Allen, Tipton and La Grange Counties, Indiana, and from Sweet Springs and White Sulphur Springs, West Virginia. On the type specimen of *Crataegus Brownii* from Buchanan, Botetourt County, Virginia, the leaves on the flowering branch vary from elliptic to oblong-obovate ,and are not at all or only slightly lobed, and those of a fragment of what appears to be from the end of a young branch are slightly lobed with small rounded lobes. Between the type of *C. Brownii* and that of *C. Margaretta* innumerable forms occur varying in the shape of the leaves and in the size of the flowers and fruit, some of these approaching *C. Margaretta* and others *C. Brownii*, and it is impossible in the mass of material before me to find constant characters by which *C. Brownii* can be distinguished from *C. Margaretta* except as a variety. This variety is especially abundant in Allen County, Indiana, where on the east side of Lake Everett about twelve miles northwest of Fort Wayne there is a thicket of these plants some five acres in extent in which Mr. C. C. Deam has found nearly all the forms growing together.

In the east the most northern station where I have seen the variety growing is at Orbisonia, Huntington County, Pennsylvania.

Crataegus Margaretta f. xanthocarpa, n. forma.

Differing from the species only in the bright yellow fruit.

IOWA. Harding County, Steamboat Rock, *L. H. Pammel*, No. 4 (type)' September 28, 1901, No. 3719, May 24, 1902.

Crataegus Harveyana (§ Intricatae), n. sp.

Leaves ovate, acuminate at apex, cuneate and often unsymmetrical at base, usually divided above the middle into short acute lobes, and finely doubly serrate with straight gland-tipped teeth; early in the season covered above by short white hairs, and pale and villose below along the slender midrib and primary veins, and at maturity dull yellow-green and smooth on the upper surface and paler and nearly glabrous on the lower surface, 4–5 cm. long and 3–4 cm. wide; petioles slender, narrowly wing-margined at apex, often glandular, densely villose early in the season, becoming nearly glabrous, 1–2 cm. in length; leaves at the end of vigorous shoots ovate, acute or acuminate at apex, rounded or cuneate at base, deeply-lobed, coarsely serrate, 6–8 cm. long, and 4–6 cm. wide, their petioles stout with broader margins and more numerous glands. Flowers opening the middle of May, on stout pedicels thickly covered with long white hairs, in many-flowered villose corymbs, with large oblong-obovate sparingly villose glandular bracts and bractlets; calyx-tube broad-obconic, covered with short matted white hairs, the lobes separated by wide sinuses, acuminate, laciniately glandular-serrate above the middle, sparingly villose on the outer surface, glabrous on the inner surface; stamens 20; anthers deep pink; styles 2 or 3. Fruit ripening the middle of September, subglobose, orange color, 1 cm. in diameter, the calyx little enlarged with a deep narrow cavity pointed in the bottom and spreading often deciduous lobes; flesh thin and dry; nutlets usually 3, gradually narrowed and rounded at the ends, only slightly ridged on the back, 6–7 mm. long and 5 mm. wide, the narrow dark hypostyle extending nearly to the middle.

A shrub 2–2.5 mm. high, with stems covered with smooth dark bark, and slender nearly straight branchlets thinly covered early in their first season with white matted pale hairs, light red-brown and lustrous in their second season, becoming the following year ashy gray or dark brown, and armed with slender straight chestnut-brown spines 3.5–6 cm. in length.

ARKANSAS. Carroll County, rocky open woods, Eureka Springs, *E. J. Palmer*, No. 5532 (16) (type) May 10, 1914, No. 20478 (16) September 10, 1921.

This distinct species is named for Professor Le Roy Harvey who in 1883 published a catalogue of the trees of Arkansas.

Crataegus conjungens (§ Triflorae), n. sp.

Leaves oblong-obovate, acute at apex, gradually narrowed to the concave-cuneate base, and coarsely often doubly serrate with broad acute

or rounded teeth; nearly half grown when the flowers open and then roughened above by short white hairs and slightly villose below along the midrib, and at maturity dark yellow-green and scabrate on the upper surface and pale and still sparingly villose along the midrib below, 3–4.5 cm. long and 2–2.5 cm. wide; petioles slender, slightly winged at the apex by the decurrent base of the blade, 8–10 mm. in length. Flowers opening the middle of May, 1.5–1.8 cm. in diameter, on slender slightly villose pedicels in small usually 3- or 2- or 1-flowered corymbs, the pedicel of the central flower of the 3-flowered corymb not more than one quarter the length of the others; calyx-tube narrow-obconic, villose, the lobes foliaceous, gradually narrowed from the base, acuminate, laciniately glandular-serrate above the middle, slightly villose; stamens 20; anthers white; styles 3–5. Fruit ripening the end of October, subglobose, orange-red, 1 cm. in diameter, the calyx only slightly enlarged with a short tube, a narrow deep cavity pointed in the bottom and spreading and reflexed lobes; flesh thin and dry; nutlets usually 3, rounded at the ends, broader at the apex than at the gradually narrowed base, rounded and only slightly grooved or rarely obscurely ridged on the back, 6–7 mm. long and 4–5 mm. wide.

A small shrub with slender branchlets yellow-brown and covered with white matted hairs during their first season and dark gray the following year, and armed with slender straight gray spines 1.5–3 cm. in length.

VIRGINIA. Alleghany County, gravelly hill-slopes along the James River, Clifton Forge, *T. G. Harbison*, Nos. 9 (type) and 16, May 23 and October 25, 1919.

A specimen with young fruit collected by *John K. Small* on Walker Mountain, at Shannon Gap, Smythe County, Virginia, June 20, 1892, should perhaps be referred to this species. By the shape and size of its leaves, small flowers and fruit and by its general aspect this species might be considered one of the Uniflorae to which plants with 3- or 4-flowered corymbs have been referred. The normally 3-flowered inflorescence, however, with two long and one short central pedicel, the character on which the Triflorae Group is based, is such an important one that I am inclined to refer it to that Group, considering it an intermediate and connecting link between the Uniflorae and Triflorae.

Crataegus choriophylla (§ Uniflorae), n. sp.

Leaves obovate to elliptic, acute or acuminate at apex, gradually narrowed and cuneate at the glandular base, divided above the middle into short acute lobes, and coarsely often doubly serrate with wide blunt or acute teeth; when they unfold tinged with red and covered above and on the midrib and primary veins below with short white hairs, and at maturity thick dark yellow-green, smooth and lustrous on the upper surface, paler and nearly glabrous on the lower surface, 3–4 cm. long and 2.5–3 cm. wide, with a slender midrib slightly villose toward the base of the leaf and with thin primary veins impressed on its upper surface; petioles stout, narrowly wing-margined at apex, villose early in the season, becoming

glabrous, glandular, 8–10 mm. in length; leaves at the end of vigorous shoots ovate, long-pointed and acuminate at apex, rounded at the wide base, acutely lobed above the middle, more coarsely serrate, thick and coriaceous, more lustrous on the upper surface, up to 5 cm. long and 4.5 cm. wide, their petioles stout, broad wing-margined nearly to the base, 6 or 7 mm. long. Flowers appearing early in April, about 1.5 cm. in diameter, on slender pedicels covered with long white hairs, in 1- to 5- usually 3-flowered narrow densely villose corymbs with narrow oblong-ovate glandular-serrate slightly villose bracts and bractlets; calyx-tube narrow-obconic, villose, the lobes foliaceous, narrow, elongated, acuminate, laciniately glandular-serrate, slightly villose; stamens 20; anthers white; styles 4 or 5. Fruit ripening in October, on villose pedicels, in 1- or 2-fruited clusters, subglobose to slightly obovoid, orange-red, 1–1.2 cm. in diameter, the calyx little enlarged with a deep narrow cavity pointed in the bottom and spreading and closely appressed lobes; flesh thin and dry; nutlets 4 or 5, thin and rounded at the ends, rounded and only slightly ridged on the back, 1–1.1 cm. long and 5 mm. wide, the narrow dark hypostyle extending to the middle.

"A small symmetrical tree with erect or spreading branches, bark ashy gray and shallowly furrowed" with stout nearly straight unarmed branchlets light yellow-green and conspicuously covered early in their first season with matted pale hairs, becoming nearly glabrous and dull red-brown at the end of their first season and dark gray-brown the following year.

FLORIDA. Columbia County, Lake City, in dry sandy soil, *T. G. Harbison* No. 12, June 23, 1917, Nos. 5687 (type) and 5687a, April 11 and October 8, 1920.

This plant is doubtfully referred to the Uniflorae. From the other species of that Group it differs in the broad-ovate coriaceous leaves on vigorous shoots, the more numerous-flowered corymbs, spineless branches and in its arborescent habit. Mr. Harbison who discovered it thought at one time that it might belong to the Flavae Group. "This," he writes, "is one of the most distinct looking of the genus. When I first saw it I was inclined to think that it might be a hybrid. In general appearance it does not suggest the Flavae Group. The sepals look like those of some of the Uniflorae, and the fruit is firm like the fruit of most of the species of that group."

Crataegus Croomiana (§ Uniflorae), n. sp.

Leaves obovate to rhombic, acute at apex, gradually narrowed and cuneate at base, coarsely serrate above the middle with rounded or acute teeth; roughened above early in the season by short white hairs, and sparingly villose below especially on the slender midrib and obscure primary veins, and at maturity thin, blue-green and slightly roughened above, paler and nearly glabrous below, 2.5–3 cm. long and 1.5–2 cm. wide; petioles slender, slightly winged at apex by the decurrent blade, densely

villose early in the season, becoming nearly glabrous, 3–6 mm. in length; leaves at the end of vigorous shoots broad-obovate to suborbicular, occasionally slightly lobed with short rounded lobes, more coarsely serrate, up to 3 cm. in diameter. Flowers opening the middle of April, 1 cm. in diameter, nearly sessile, solitary (on the single specimen in this herbarium), the short pedicels thickly covered with long matted white hairs; calyx broad-obconic, villose, the lobes slender, acuminate, nearly entire or laciniately glandular-serrate above the middle, villose; stamens 20; anthers rose color; styles 5. Fruit obovoid, gradually tapering to the base, 1–1.2 cm. long, 8–9 mm. in diameter, the calyx prominent with a short tube, a broad deep cavity pointed in the bottom, and spreading and reflexed much enlarged lobes; flesh thin, dry and mealy; nutlets 5, rounded at apex, gradually narrowed and acute at base, rounded and grooved on the back, 6–7 mm. long and 3 mm. wide, the narrow dark hypostyle extending nearly to the base.

A shrub 1.5–2 mm. high, with very slender branchlets covered early in the season with matted pale hairs, dull red-brown and slightly pubescent, becoming glabrous in their second season, and ashy gray and glabrous the following year, and armed with numerous slender dark chestnut brown spines 2–4 cm. in length.

Florida. Leon County, upland woods in sandy soil near, Tallahassee, *T. G. Harbison* Nos. 5710 (type) and 5710a, April 15 and October 6, 1920.

This species generally resembles *C. uniflora* Moench, the type of the Group, which differs from the Tallahassee plant by its usually more pubescent leaves, yellow anthers, subglobose rarely slightly obconic fruit with a more enlarged calyx. It is named for Henry B. Croom, a native of Newbern, North Carolina, who for many years visited his plantations in western Florida every winter, and in 1833 discovered Torreya on the bank of the Appalachicola River, and who wrote and published papers on the flora of the southern states.

Crataegus Victorinii (§ Macracanthae), n. sp.

Leaves ovate to oval or obovate, rounded and short-pointed or acute at apex, abruptly concave-cuneate at base, often slightly and irregularly lobed with acuminate lobes, and sharply doubly serrate usually only above the middle with straight teeth; nearly fully grown when the flowers open and then glabrous with the exception of a few hairs on the upper side of the midrib, and at maturity thin, glabrous, dull dark green on the upper surface, paler on the lower surface, 3.5–4 cm. long and 2.5–3 cm. wide, with a stout midrib and prominent veins impressed above; petioles stout, narrow, wing-margined to the middle, glabrous, 1–1.5 cm. in length; leaves on vigorous shoots obovate, rounded at apex, more acutely cuneate at base, lobed with longer acuminate lobes, 4.5–5 cm. long and 3–4 cm. wide. Flowers opening early in June, 1.5 cm. in diameter, on long slender pedicels in wide 10–25-flowered glabrous corymbs; calyx-tube

broad-obconic, glabrous, the lobes separated by wide sinuses, laciniately glandular-serrate, glabrous on the outer surface, puberulous on the inner surface; stamens 10; anthers rose color; styles 2–5. Fruit ripening the middle of September, on slender drooping pedicels in many-flowered clusters, subglobose, scarlet, lustrous, 8–10 mm. in diameter, the calyx little enlarged with a short tube, spreading and reflexed lobes, and a deep narrow cavity pointed in the bottom; flesh thick and succulent; nutlets 2–5, rounded at apex, narrowed at base, only slightly grooved on the back, penetrated on the inner face by narrow shallow grooves, the narrow dark hypostyle extending to about the middle.

A round-topped tree 4–5 m. high, with yellow-green bark and stout glabrous branchlets very rarely furnished with stout nearly straight chestnut-brown spines 5 cm. long or entirely spineless, yellow-green when they first appear, becoming chestnut-brown, lustrous and marked by pale lenticels at the end of their first season and dark red-brown the following year.

CANADA. Province of Quebec, Longueuil, opposite Montreal, in the grounds of College Longueuil *Brother Victorin*, No. 27 (type), June 4 and September 22, 1913; Outremont, Montreal Island, *Brother Victorin*, No. 31, May 29 and September 11, 1914.

Glabrous species in the Macracanthae are rare. On page 10 of this volume of the Journal one of these, *C. nuda* Sarg. of southern Missouri, was described and of the eastern species previously described only one, *C. bristoliensis* Sargent from southern Massachusetts, has ten stamens and rose-colored anthers. The other species have yellow anthers. From *C. bristoliensis* this new species differs in its larger, thinner and more deeply and regularly lobed acuminate leaves, in its narrow calyx-lobes, in its ellipsoidal to obovoid fruit, and in its more numerous spines.

Crataegus carrollensis (§ Macracanthae), n. sp.

Leaves ovate to rarely obovate, acuminate at apex, abruptly or gradually narrowed and concave-cuneate at base, slightly and irregularly divided usually only above the middle and coarsely often deeply serrate with straight gland-tipped teeth; more than half grown when the flowers open and then covered above with short white hairs and slightly villose below especially on the midrib and veins, and at maturity thin, yellow-green, smooth, lustrous and glabrous above, still villose below, 7–10 cm. long and 5.5–7 cm. wide, with a stout midrib and slender primary veins; petioles stout, wing-margined toward the apex by the decurrent leaf blade, densely villose early in the season, becoming pubescent in the autumn 2–2.5 cm. in length. Flowers (only buds seen) in many-flowered corymbs, densely covered with matted white hairs, with conspicuous oblong-obovate to linear-lanceolate bracts and bractlets; calyx-tube narrow-obconic, villose, the lobes narrow-acuminate, laciniately glandular-serrate, sparingly villose or glabrous on the outer surface, glabrous on the inner surface; stamens 15–20; anthers pale yellow; styles 2 or 3. Fruit ripening pro-

bably in October, on stout glabrous pedicels, ellipsoidal, dark red, the calyx with a short tube, spreading and reflexed lobes and a shallow wide cavity pointed in the bottom, 6 or 7 mm. long and 5 or 6 mm. wide; nutlets 2 or 3, acute at apex, rounded at base, slightly grooved on the back, penetrated on the inner face by short grooves, 5 mm. long and 3 mm. wide, with a narrow hypostyle extending to the middle.

A stout shrub 2–3 m. high, covered with gray scaly bark, thick erect pale gray branches and stout branchlets yellow-green and sparingly covered with pale hairs when they first appear, becoming red-brown and glabrous in their second season and armed with numerous stout straight chestnut brown lustrous spines 4–6.5 cm. long, becoming branched and persistent on old stems.

ARKANSAS. Carroll County, rocky hillsides, Eureka Springs, *E. J. Palmer*, No. 5521 (type), September 23, 1913, No. 5521, May 9, 1914.

Crataegus kingstonensis (§ Anomalae), n. sp.

Leaves elliptic to broad-ovate, acuminate at apex, gradually narrowed and cuneate or rarely rounded at base, divided toward the apex into short acuminate spreading lobes, and coarsely often doubly serrate above the middle with straight glandular teeth, thin, glabrous, dark yellow-green, smooth and lustrous above, pale or glabrous below, 5–7 cm. long and 4–5 cm. wide, with a slender midrib and primary veins; petioles slender, 1–1.5 cm. in length. Flowers opening early in June on long slender pedicels in lax mostly 7–10-flowered glabrous corymbs; calyx-tube broad-obconic, glabrous, the lobes gradually narrowed from the base, acuminate, sharply serrate or entire, glabrous on the outer surface, puberulous on the inner surface; stamens 20; anthers bright red; styles 4 or 5. Fruit ripening the middle of October, subglobose, about 1.5 cm. in diameter, dark red, with soft succulent flesh; the calyx little enlarged with spreading appressed lobes and a deep narrow cavity rounded in the bottom; nutlets 4 or 5, rounded at the ends, ridged on the back with a low grooved ridge, obscurely grooved on the inner faces, 6–7 mm. long and 5–6 mm. wide, the narrow hypostyle extending to the middle.

A tree 7–8 m. high, with a trunk 2 m. long, and stout glabrous branchlets yellow-green when they first appear, becoming dark chestnut brown and lustrous by the end of the first season and dull red-brown the following year, and armed with many stout nearly straight chestnut-brown spines 3–4 cm. in length.

CANADA. Province of Ontario, near Kingston, *J. Dunbar*, No. 113 (type) and No. 117, October 19, 1911, June 6, 1912.

This is an interesting addition to the small number of Anomalae with glabrous corymbs and 20 stamens. It is most closely related to *C. fallsiana* Sarg. from Little Falls, Herkimer County, New York, with the same shaped leaves and the same succulent fruit, but the flowers and fruit of the Kingston tree are much larger. The two species are more

distinct in the roughness of the upper surface of the leaves of the New York plant at the time the flowers open, caused by the bases of the hairs which cover it as the leaves unfold, those of *C. kingstonensis* being always glabrous.

Betula neoalaskana, n. nom.—*Betula alascana* Sargent in Bot. Gaz. XXXI. 236 (1901), not Lesquereux in Proc. U. S. Nat. Mus. v. 446 (1883).

Dr. C. V. Piper calls my attention to this earlier use of the name *Betula alaskana* for a fossil tree necessitating a new name for the existing species.

Gleditsia texana Sargent.

This species was based on a grove of trees growing near Brazoria in the valley of the lower Brazos River in Texas. When these trees were described in 1901 only the Brazoria trees were known but since 1901 specimens of what is evidently the same tree have been collected on the banks of the Red River near Shreveport, Louisiana, at Yazoo City, Mississippi, and by a roadside ½ mile west of Skelton, Gibson County, Indiana (C. C. Deam No. 35,123, September 27, 1921). On the Brazos River *G. texana* grows in company with *G. triacanthos* Linnaeus and *G. aquatica* Marshall and these species occur in the other localities where this tree has been met with; and as only a few individuals have been found in widely scattered localities there seems every reason to believe that *G. texana* is a hybrid of *G. triacanthos* and *G. aquatica*.

The trees have the habit of *G. triacanthos* and the branches of the Texas tree are unarmed but those from Louisiana are furnished with stout simple spines and on the Indiana tree the spines are stout or compound. The leaves of these trees resemble those of *G. triacanthos*, but they all have short thin walled fruit without the pulp of that species and in this resemble *G. aquatica*. On one of the Louisiana specimens the fruit varies in length from 6–11 cm. The longest of these fruits have the straight margins and the rounded base of that of *G. triacanthos*, on some of the shortened fruits the margins are more or less contracted between the seeds and the shortest are one-seeded and generally narrowed into a long cuneate base. The length of the fruits of the Mississippi specimen collected by S. M. Tracy are 10 cm. long with a rounded base, deeply contrated between the three seeds and the shorter is 4 cm. long with a stipe-like base and one seed.

Thomas Nuttall landed in January 1819, on an island in the Mississippi River near the mouth of White River, Arkansas "and for the first time recognized the short podded, honey-locust (*Gleditsia brachycarpa*), a distinct species, intermediate with the common kind (*G. triacanthos*) and the one-seeded locust (*G. monosperma*), differing from *G. triacanthos* in the persisting fasciculated legumes, as well as in their shortness and want

of pulp." (Travels into the Arkansas Territory p. 63). A few days later he saw the three Gleditsias growing together on the banks of the lower Arkansas River. Judging by the locality Nuttall's *G. brachycarpa* is the hybrid of *G. texana* and not the *G. brachycarpa* of Pursh which was from the mountains of Southwestern Virginia a region far beyond the range of *G. aquatica*. As a synonym of his species Pursh quotes *G. triacanthos brachycarpos* of Michaux for which Michaux gave no locality.

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE HERBARIUM AND THE COLLECTIONS OF THE ARNOLD ARBORETUM[1]

ALFRED REHDER

Juniperus squamata var. **Meyeri,** var. nov.

A typo recedit habitu erecto vel ascendente foliis dorso eximie glaucis. Frutex humilis, ramis erectis vel ascendentibus dense ramulosis ramulis brevibus erectis vel suberectis; internodia brevia pallide luteo-viridia; folia lineari-lanceolata, 6–10 mm. longa, circiter 1.5 mm. lata, a medio in apicem spinulosam sensim attenuata, dorso fere ad apicem leviter sulcata, ventre fasciis duobus albis stomatiferis notata, nervo medio leviter elevato glauco; fructus plerique ad basin ramulorum, erecti, pedunculo brevissimo dense bracteato suffulti, ovoideo-oblongi, circiter 6 mm. longi (ut videtur non bene evoluti et steriles) medio squamulorum apicibus liberis triangularibus plerumque 3 instructi, apice depressi, atro-brunnei, demum fere atri, levissime pruinosi; semen conico-ovoideum acutum et apiculatum, 2–3- costatum.

Cultivated at the Arnold Arboretum (plants received from Hick's Nursery as "Meyer's Juniper;" specimens collected October 3, 1919, September 15, 1922 (type); U. S. Department of Agriculture, S. P. I. No. 23023, comm. *H. C. Skeels*, November, 1921.

This Juniper was found by Frank N. Meyer in Tientsin, Chili, grown by the Chinese as a pot plant and supposed to have come from southwestern Shantung. The Chinese graft it on *Thuja orientalis*; how this is done is shown by Meyer's photograph No. 12258 taken near Shin yeh, Honan; an older plant of this variety is shown in his photograph No. 12407, taken at Peking. This Juniper is a very handsome form on account of its striking blue-white color and its dense habit. From the commonly cultivated form of *J. squamata* Lambert it is chiefly distinguished by the dense upright or ascending habit and by the bluish white longer leaves. It has proved perfectly hardy at the Arnold Arboretum and fruited this year for the first time, though the seeds were sterile.

[1]Continued from p. 51.

Juniperus lucayana var. **bedfordiana**, comb. nov.—*Juniperus Bedfordiana* Loudon, Trees & Shrubs, 1090 (1842), nomen.—Henry in Elwes & Henry, Trees Gt. Brit. Irel. VI. 1437 (1912).—*J. gracilis* Endlicher, Syn. Conif. 31 (1847.—*J. virginiana Bedfordiana* Hort. apud Knight & Perry, Syn. Conif. 12 (1850), nomen.—Parlatore in DeCandolle, Prodr. XVI. 2, 489 (1868), as var.—Veitch, Man. Conif. 284 (1881); Kent Veitch's Man. Conif. ed. 2, 193 (1900). –Koehne, Deutsch. Dendr. 54 (1893), as forma.—*Juniperus virginiana gracilis* Sargent, Silva N. Am. X. 96 (1896).

This form which is usually referred to *J. virginiana* as a form or variety is apparently a juvenile form of *J. lucayana* Britton; and Gordon and some other authors have already united it with *J. barbadensis* Auth., not Linnaeus (*J. virginiana barbadensis* Gord.), which is a synonym of *J. lucayana*. It differs from the type of that species in its acicular leaves; from juvenile forms of *J. virginiana* it may be distinguished by its slenderer pendulous branchlets, slenderer and rather longer leaves and by its tenderness in northern latitudes where *L. virginiana* is hardy. I suspect, however, that at least some of the Junipers grown in European gardens as *J. bedfordiana* and reported to be hardy in northern and middle Europe are forms of *J. virginiana*.

Pinus nigra Arnold var. **cebennensis**, comb. nov.—*P. Laricio* Lapeyrouse, Hist. Pl. Pyrén. II. 588 (1813), not Poiret.—*P. pyrenaica* Lapeyrouse, Hist. Fl. Pyrén. Suppl. 146 (1818), in part, only as to the locality cited.—Loudon, Arb. Brit. IV. 2209 (1838), in part.—Hort. apud Carrière, Traité Gén. Conif. 390 (1855), as synon. of *P. Salzmanni*.—*P. Laricio* var. *pyrenaica* Loudon, Arb. Brit. IV. 2202 (1838), in part.—Godron in Grenier & Godron, Fl. France, III. 153 (1855), excl. syn. *P. pyrenaica* Lap. –*P. Salzmanni* Dunal in Mém. Acad. Montpell. II. 81, tab. 12 (1851).—*P. monspeliensis* Salzmann ex Dunal, l. c. 83 (1851), as synon.—*P. Laricio* var. *cebennensis* Godron in Grenier & Godron, Fl. France, III. 153 (1855).—Rehder in Bailey, Cycl. Am. Hort. III. 1355 (1901).—*P. cebenensis* Hort. ex Gordon, Pinetum, ed. 2, 239 (1875), as synon. of *P. Laricio*.—*P. Laricio* var. *leptophylla* Christ in Bot. Zeit. XXIII. 230 (1865).—*P. Laricio* var. *tenuifolia* Parlatore in DeCandolle, Prodr. XVI.[2] 387 (1868).—*P. Laricio* var. *Salzmanni* Richter, Pl. Eur. I. 2 (1890).—*P. Laricio* var. *monspeliensis* Koehne, Deutsch. Dendr. 38. (1893). *P. nigra Salzmannii* Ascherson & Graebner, Syn. Mitteleur. Fl. I. 215 (1897).—*P. cebennensis* Hort. ex Rehder in Bailey, Cycl. Am. Hort. III. 1355 (1901), as synon.—*P. horizontalis* Hort. ex Rehder, l. c. (1901), as synon., not Roezl.—*P. nigra leptophylla* Ascherson & Graebner, Syn. Mitteleur. Fl. I. ed. 2, 333 (1912).—Teuscher in Mitteil. Deutsch. Dendr. Ges. XXXI. 103 (1921).—*P. nigra* var. *tenuifolia* Schneider in Silva-Tarouca, Uns. Freiland-Nadelh. 262 (1913).

The oldest available varietal name of this variety is apparently *P. Laricio* var. *cebennensis* Godr. *Pinus Laricio* var. *pyrenaica* Loud., though

partly referable to this variety, is based, as its name indicates on *P. pyrenaica* Lapeyrouse which belongs to *P. halepensis* Mill. or more especially to its var. *brutia* A. Henry (*P. brutia* Ten.). This is clearly stated by H. de Vilmorin (in Bull. Soc. Bot. France, XL. LXXVII. [1893]; see also Ascherson and Graebner, Syn. Mitteleur. Fl. I 219), who shows that Lapeyrouse in 1813 under *P. Laricio* described andunder stood a variety of *P. Laricio* found in the Pyrenees, while in 1818 in the Supplement he published under the name *P. pyrenaica* a new description based on a tree growing in his park near Toulouse and supposed by him to be the same as his *P. Laricio* from the Pyrenees. The tree in his park, however, was not the Pine from the Pyrenees, but *P. halepensis* var *brutia* A. Henry, probably raised from seed received from the Orient

Potentilla fruticosa var. **Purdomii,** var. nov.

A typo recedit praecipue foliolis minoribus, 7–10 mm. longis, subtus glaucescentibus ad costam sparse longe pilosis ceterum glabris vel fere glabris floribus pallide luteis.—Frutex erectus ramis tenuibus elongatis laxe pilosis; folia 5-foliolata; foliola elliptico-oblonga vel obovato-oblonga, acuta, margine leviter revoluta, supra obscura viridia laxe longe adpresse pilosa; flores 1 1.8 cm. diam. in corymbis plurifloris; bracteae calycinae oblongo-oblanceolatae, sepalis subaequilongae; stamina circiter 25, stylis paullo longiora.

Cultivated at the Arnold Arboretum, raised from seed collected by W. Purdom in southern China and sent under Seed No. 848 in 1911; specimen collected September 6, 1922.

Though this form of *Potentilla fruticosa* L. differing chiefly in the smaller leaflets glaucescent and nearly glabrous beneath and in the pale yellow flowers, is not strikingly different from the type and some of its variations, it cannot be referred to any of the forms described, and is therefore proposed here, though reluctantly in this polymorphous species, as a new variety.

Rosa Maximowicziana var. **Jackii**, comb. nov.—*R. coreana* Keller in Bot. Jahrb. XLIV, 47 (1909), not *R. koreana* Komarov.—*R. Kelleri* Baker in Willmott, Gen. Rosa, I. 75 (1910), not Dalla Torre & Sarntheim.—*R. Jackii* Rehder in Mitteil. Deutsch. Dendr. Ges. XIX, 259 (1910) ;in Bailey, Stand. Cycl. Hort. v. 2998 (1916).—*R. Maximowiziana* Nakai, Fl. Sylv. Kor. VII. 26, t. 3 (1918), only as to tab. 3.

This Rose differs from typical *R. Maximowicziana* only in the absence of the prickles on the stems and branches which are numerous at least on the more vigorous shoots in the type. When I described *R. Jackii* I knew *R. Maximowicziana* Regel only from the description, and as the species was described as a dense upright shrub, the branches and branchlets armed with prickles and bristles, I concluded that it must be an entirely different plant. Since then, however, we have received material of typical *R. Maximowicziana* from Manchuria as well as from Korea and find that the habit is not upright, but sarmentose as correctly described by Nakai,

who figures typical *R. Maximowicziana* on plate I of part VII of his Flora sylvatica koreana. The only difference which remains now between the two forms is the absence of bristles on the stems and branches in *R. Jackii* which certainly cannot be considered a specific difference.

Rosa omeiensis f. **chrysocarpa,** forma nov.

A typo recedit fructu luteo majore.—Frutex ramis aculeis basi valde dilatatis armatis, turionibus insuper dense aciculate-setosis: folia ramulorum pleraque 5-juga, turionum 6–7-juga foliolis glabris; fructus stipite carnoso parti superiori subaequilongo incluso circiter 2 cm. longus et 11–12 mm. diam.

Raised from seed sent from western China by E. H. Wilson to the Arnold Arboretum in 1908 or 1910; specimens collected in Hort. H. S. Hunnewell, Wellesley, Massachusetts, by *Mrs. S. D. McKelvey*, August 8, 1922. (type).

This form differs in its bright yellow fruits from typical *R. omeiensis* Rolfe which has the fruits entirely red or sometimes red with the stalk-like stipe colored orange. The lighter and brighter color of the larger fruits makes this form even more conspicuous at fruiting time than the red-fruited type, though unfortunately the fruit of *R. omeiensis* which ripens early in July and a month later in the yellow-fruited form drops soon after ripening and therefore the display does not last long.

Hamamalis virginiana L. f. **rubescens**, forma n.

A typo recedit petalis praesertim basin versus rubescentibus.

Originated at the Arnold Arboretum; type specimen collected Oct. 31, 1921, *C. Vandervoet.*

This form differing in the light red flowers from the type was first noticed in the autumn of 1921 by Mr. C. Vandervoet on an old plant probably brought from the woods in eastern Massachusetts and now growing in this Arboretum. When in full bloom this red-flowered form contrasts conspicuously with the typical form with its pale yellow flowers. The form is, however, not entirely new, for a shrub with light red flowers had been observed more than 30 years ago near Malden, Massachusetts, by Edward L. Rand (Sargent, Silva N. Am. V. 4, [1893]).

In the color of its flowers *H. virginiana* f. *rubescens* resembles the Japanese *H. incarnata* Makino, a species flowering in winter and early spring closely related to *H. japonica* Sieb. & Zucc., but in that species the sepals are deep red on the inner surface, while in our form they are yellowish green to brownish green.

Skimmia Reevesiana Fortune, Journ. Tea Countr. China, 329 (1852).—*S. japonica* Lindley in Paxton's Flow. Gard. II. 56, fig. 163 (1851), not Thunberg, except Zuccarini's description; in Gard. Chron. 1852, 183.—Fortune in Gard. Chron. 1852, 739, 789.—Hooker in Bot. Mag. LXXIX. t. 4719 (1853), exclusive of synonyms.—Carrière in Rev. Hort. 1869, 259, fig. 60.—Engler in Engler & Prantl, Nat. Pflanzenfam. III. Abt. 4, 181 (1897), in part.—Pritzel in Bot. Jahrb. XXIX. 424 (1900).—*S. Fortunei*

Masters in Gard. Chron. ser. 3, v. 520, fig. 9 (1889).— Dippel, Handb. Laubholzk. II. 356, fig. 165 (1892).—Rehder in Bailey, Cycl. Am. Hort. IV. 1671 (1902).—Schneider, Ill. Handb. Laubholzk. II. 127, fig. 80c, 81 l-m (1907).

The name given by Fortune to the Chinese Skimmia introduced by him in 1849 to England seems to have been entirely overlooked. Though he does not give a technical description of his new species, he states that it is the *S. japonica* as described by Lindley and thus bases his name on a definite description. The change in the name of this species makes necessary the following new combination:

Skimmia Reevesiana f. **rubella**, comb. nov.—*S. intermedia* Carrière in Rev. Hort. 1870, 200; 1874, 311.—Nicholson, Ill. Dict. Gard. III. 440 (1887).—*S. rubella* Carrière in Rev. Hort. 1874, 311, tab.; 1880 57, fig. 12; 1885, 189, fig. 35.—*S. Fortunei* f. *rubella* Voss, Vilmorin's Blumengärt. I. 172 (1894).—Rehder, in Bailey, Cycl. Am. Hort. IV. 1671 (1902), as var.

This form differs from the type chiefly in its reddish peduncles, pedicels and flower buds. It was first described by Carrière as *S. intermedia* and stated to be of unknown origin, but four years later he described and figured it as *S. rubella* and stated that it was introduced from China about 1865 by Eugène Simon. Carrière describes it as intermediate between *S. japonica* and *fragrans* which is according to our present nomenclature *S. Reevesiana* and *S. japonica*, but its hybrid origin seems very doubtful.

Skimmia Reevesiana f. **variegata**, comb. nov.—*S. japonica variegata* Anon. in Gard. X. 364 (1878).—Mouillefert, Arb. Arbriss. I. 214 (1891).—*S. japonica argentea variegata* Nicholson, Ill. Dict. Gard. III. 441 (1887).—*S. Fortunei* var. *argentea* Masters in Gard. Chron. ser. 3, v. 553 (1889).

A form with the leaves bordered white.

× **Skimmia Foremanii** Knight in Florist & Pomol. 1881, 70 (as *S. Foremanni*)—(*S. japonica* × *Reevesiana*).—Masters in Gard. Chron. ser. 3, v. 553 (1889).—Bean, Trees and Shrubs Brit. Isles, II. 514 (1914).—*S. intermedia* Rehder in Bailey, Cycl. Am. Hort. IV. 1671 (1902), not Carrière.—Schneider, Ill. Handb. Laubholzk. II. 127 (1907).

This form is according to Knight a hybrid between *S. japonica* and *S. oblata* (= *S. Reevesiana* × *japonica*) raised by Mr. Foreman of Dalkreith. It was first exhibited in Edinburgh at the Spring Meeting of the Royal Caledonian Horticultural Society in 1881, and was awarded a First-class certificate. As Masters points out, the occurrence of two forms of fruit in the same panicle and their color indicates the hybrid origin of the plant.

× **Skimmia Foremanii** var. **Rogersii** comb. nov.—*S. Rogersii* Masters in Gard. Chron. ser. 3, v. 553 (1889).

This form was discovered about 1878 by W. H. Rogers of Southampton among seedlings of *S. oblata*, but shows the influence of *S. Reevesiana*

in its hermaphrodite flowers and the crimson color of its depressed-globose berries.

Cotinus coggygria f. purpureus, comb. nov.—*Rhus Cotinus purpureus* Dupuy-Jamain in Rev. Hort. 1870–71, p. 567.—*Rhus Cotinus atropurpurea* Burvenich in Rev. Hort. Belg. XI. 257 (1885).—Voss, Vilmorin's Blumengärt. I. 190 (1894), as forma.—*Cotinus coccygea* var. *atropurpurea* Dippel, Handb. Laubholzk. II. 382 (1892).—*Cotinus coggygria* f. *atropurpurea* Schneider, Ill. Handb. Laubholzk. II. 146 (1907).

This form differs from the type in the deep purple color of the hairs of its fruiting panicle. The form mentioned in Garden, LXXXV. 283 (1921) under the name *Rhus Cotinus purpureus* and described as having purple leaves, is unknown to me, but if it is distinct from *R. Cotinus purpureus* Dupuy-Jamain, as it appears to be, it should receive a new name.

× **Ilex Beanii**, nom. nov. (*I. Aquifolium* × *dipyrena*).—*I. Aquifolium* var. *elliptica* Nicholson in Kew Hand-list Arb. I. 57 (1894), nomen.—*I. Aquifolium* var. *flammea angustifolia* ex Nicholson, l. c. (1894), as synonym.—*I. dipyrena* var. *elliptica* Dallimore, Holly, Yew & Box, 124 (1908).—*I. elliptica* Bean, Trees & Shrubs Brit. Isles, I. 647 (1914), not Humbold, Bonpland, Kunth.

SPECIMEN EXAMINED: Kew Arboretum, cultivated, *W. J. Bean*, November 27, 1920.

As the name *I. elliptica* is preoccupied by the Peruvian *I. elliptica* Humbold, Bonpland & Kunth, Nov. Gen. Spec. VII. 54 (70) (1825), this interesting Ilex may bear the name of Mr. W. J. Bean who first pointed out that it is very likely a hybrid between *I. Aquifolium* L. and *I. dipyrena* Wall.

Ilex vomitoria Aiton, Hort. Kew. I. 170 (1789).—Trelease in Gray, Syn. Fl. I, pt. 1, 389 (1897).—Sargent, Sylva N. Am. I. 111, t. 48 (1891); Man. ed. 2, 671, p. 605 (1922).—*I. Cassine* β. Linnaeus, Spec. I. 125 (1753).—*Cassine Peragua* Linnaeus, l. c. 268 (1753) in part, as to the second native country "Carolina".—*Prinos glaber* Linnaeus, Spec. ed. 2, I. 471 (1762), in part, as to both synonyms.—*Cassine Paragua* Miller, Dict. Gard. I. no. 2 (1768).—*Cassine caroliniana* Lamarck, Encycl. Méth. I. 652 (1782), as to the synon. "Bauh. Pin. 170".—*Ilex Cassine* Walter, Fl. Carol. 241 (1788), not Linnaeus.—Watson, Bibl. Ind. N. Am. Bot. I. 157 (1878).—*I. floridana* Lamarck, Tabl. Encycl. Méth. I. 356 (1791).—Poiret, Suppl. Encycl. Méth. III. 67 (1813).—*I. Cassena* Michaux, Fl. Bor.-Am. II. 229 (1803).—*I. religiosa* Barton, Fl. Virg. 66 (1812).—*Hierophyllus Cassine* Rafinesque, Med. Fl. II. 8 (1830).—*Ageria Cassena* Rafinesque, l. c. 47 (1838).—*Oreophila myrtifolia* Scheele in Roemer, Texas, 432 (1849), not Nuttall[1]).—*I. Peragua* Trelease in Trans. St. Louis

[1] This synonym is marked with a query by Watson and Loesener, but as *I. vomitoria* grows near Houston and is the only evergreen shrub there which has a close resemblance to *Oreophila myrtifolia* Nuttall = *Pachistima myrsinites* Raf., there can be little doubt that Scheele's name should be referred here.

Acad. Sci. v. 346 (1889), excl. synon. *Cassine Peragua* L.—*I. Caroliniana* Loesener in Bot. Centralbl. XLVII. 163 (1891); in Nov. Act. Leop.-Carol. Akad. LXXVIII. 341 (Monog. Aquifol.) (1908), excl. synon. *Cassine caroliniana* Lam. not Miller, nor Trelease[2]).

Though a large number of names have been bestowed on the plant best known as *Ilex vomitoria* Aiton, the oldest specific name given to it seems to have escaped notice and is not enumerated in Index Kewensis. This is Miller's *Cassine Paragua* of 1768; Miller cites in his short description the figure published in his Figures of the most beautiful . . . plants (I. 55, t. 83, fig. 2 [1760]), where he also quotes Catesby's plate (Nat. Hist. Car. II. 57 [1743]), and the "Cassine vera Floridanorum arbuscula baccifera, Alaterni (not "alterni" as printed in Linnaeus' Spec.) ferme facie" of Plukenet (Mant. 40 [1700]). All these quotations belong to *I. vomitoria* Aiton without any extraneous element being involved. There could be, therefore, no doubt of the validity of Miller's name if it were not for the name *Cassine Peragua* Linnaeus (Spec. I. 268 [1753])[3], which should be considered a homonym, as the difference in the spelling is too slight to make them different names. If we reject the name *C. Paragua* Miller as being a homonym of *C. Peragua* Linnaeus the question arises if *Cassine caroliniana* Lamarck should be taken up as the next oldest name, as was done by Loesener who made in 1891 the combination *Ilex caroliniana*.

[2] The following names referred by some authors as synonyms to *I. vomitoria* should be excluded:

I. ligustrina Jacquin, Icon. Pl. Rar. II. 9, t. 310 (1789?); Collect. IV. 105 (1790).—This is a distinct species and is treated as such by Loesener; the native country is given by Jacquin as "Carolina," but that is probably an error (see Loesener in Nov. Act. Leop.-Carol. Akad. LXXVIII. 319, obs. 2 [Monog. Aquifol.] [1901]).

Winterlia triflora Moench, Meth. 74 (1794). K. Koch (Hort. Dendr. 211 [1853] and Dendr. II. pt. 1, 225 [1875] where he cites the name by mistake as *Winterlia glabra*) and Trelease (in Gray, Syn. Fl. II. pt. 1, 390 [1897]) are apparently right in referring this name to *Ilex glabra* as a synonym. Moench's specific description agrees well with *I. glabra* Gray but in his generic description he characterizes the flowers as 4-merous, and this probably induced Loesener to cite the name as a synonym with a query under his *I. caroliniana*=*I. vomitoria* Ait., though "petalis linearibus . . . sepala . . . petalis breviora" hardly fits that species.

Cassine ramulosa Rafinesque Fl. Ludov. 110 (1817).—This plant can hardly belong to *Ilex vomitoria*, as it is described as having 5-merous flowers and a 3-celled ovary with 3 reflexed stigmas.

Ilex (*Emetila*) *ramulosa* Rafinesque, Sylv. Tellur. 45 (1838). This is the same as the preceding plant.

Ageria geminata Rafinesque Sylv. Tellur. 48 (1838). As the leaves are described as acute, thin and deciduous, the peduncles as "unifloris geminatis sparsis" and the habitat given as "Apalachian Mts.", it can hardly represent *Ilex vomitoria*.

[3] *Cassine peragua* Linnaeus, Spec. I. 268 (1753) a citation not given in Index Kewensis is to be considered a valid name and antedates *C. capensis* Linnaeus, Mant. 220 (1771) with which it agrees in its principal elements, that is in the figures cited (see also Loesener in Bot. Jahrb. XXVIII. 155 [1891]). The plant, however, called *C. peragua* by Linnaeus in 1771 (Mant. 220) represents *Viburnum obovatum* Walter (Fl. Carol. 116 [1788]) for which the oldest name is *Cassine corymbosa* Miller of 1768, see foot-note 5.

In doing so he apparently overlooked the existence of two older homonyms namely *Ilex caroliniana* of Miller (1768) and of Trelease (1889). According to the International Rules the first of the two homonyms could not invalidate Loesener's combination, as Miller's name is a synonym of *Ilex Cassine* L., but Trelease's name is to be accepted under the International Rules as a valid name[4]. Aside from this, however, another reason why *I. caroliniana* Loesener should be rejected, is the fact that *Cassine caroliniana* Lamarck belongs only partly to *Ilex vomitoria*, as Lamarck confused under *Cassine caroliniana* two entirely different plants namely *Ilex vomitoria* Aiton which having 4-merous flowers would not belong in his genus Cassine at all and *Viburnum obovatum* Walter. As the description seems to be chiefly based on Miller's *Cassine corymbosa*[5] and on the figure representing that species which is identical with *Viburnum obovatum*, *Cassine caroliniana* should be referred according to its chief component as a synonym to the latter species. Therefore *Ilex caroliniana* Loesener, being based on a species the type of which is identical

[4] *Ilex caroliniana* Trelease in Trans. Acad. Sci. St. Louis, v. 347, (1889).—*Cassine caroliniana* Walter, Fl. Carol. 242 (138).—*Prinos ambiguus* Michaux, Fl. Bor.-Am. II. 236 (1803).—*Synstima acuminata* Rafinesque, Sylv. Tellur. 48 (1838).—*Synstima caroliniana* Rafinesque l. c. 49 (1838).—*Ilex ambigua* Chapman, Fl. S. U. S. 269 (1860).—*Nemopanthes ambiguus* Wood, Classb. Bot. Fl. U. S. Can. 497 (1861).—*Synstima ambigua* Rafinesque "Sylv. Tellur. 48" apud S. Watson, Bibl. Ind. N. Am. Bot. 157 (1878).

According to the Philadelphia Code Trelease's combination is invalidated by the older homonym *Ilex caroliniana* of Miller, but that being a synonym of *Ilex Cassine* does not prevent the acceptance of *Ilex caroliniana* Trelease under the International Rules. Neither could Walter's *Cassine caroliniana* be rejected as non-valid on account of the older homonym of Lamarck, which as pointed out below is a synonym of *Viburnum corymbosum* Rehd. (*V. obovatum* Ait.). The point, however, may be raised, if a tentative proposition of a name as in this case where Trelease says under *Ilex ambigua* in a note: "If this specific name (*Cassine caroliniana* Walter) is to be accepted, the plant becomes *I. caroliniana* (Walt.)" should be considered a valid publication. There is nothing in the Rules which covers this point exactly, but the tendency is to accept such names, and therefore, I think, we have to accpet *I. caroliniana* Trelease as the valid name for *I. ambigua* Chapman.

[5] *Cassine corymbosa* Miller, has been referred in Index kewensis as a synonym to *Ilex Cassine*, but a glance at Miller's description and the figure and the synonyms cited that it is identical with the plants described later by Aiton as *Viburnum laevigatum* and by Walter as *V. obovatum*. As Miller's name antedates these two names the following new combination becomes necessary.

Viburnum corymbosum, comb. nov.—*Cassine corymbosa* Miller, Gard. Dict. I. no. 1 (1768).—*Cassine peragua* Linnaeus, Mant. 222 (1771).—*Cassine caroliniana* Lamarck, Encycl. Méth. I. 652 (1783), excl. syn. "Bauh. Pin." and remarks.—*Viburnum obovatum*, Walter, Fl. Carol. 116 (1788).—*Viburnum laevigatum* Aiton, Hort. Kew I. 371 (1879).—*Ilex Peragua* Trelease in Trans. St. Louis Acad. Sci. v. 346 (1889), as to the synonym *Cassine peragua* L. – *Ilex caroliniana* Loesener, Bot. Centralbl. XLVII. 163 (1891), as to the synonym *Cassine caroliniana* Lam.

Though the figure published by Miller (Fig. Pl. I. 55, t. 83, fig. 1. [1760]) and cited under his *Cassine corymbosa* is not exactly typical for the species in question, it cannot be referred to any other species than *Viburnum obovatum* Walter, which was in cultivation in England since 1724 and we have under the present rules no choice but to use the oldest specific name, even if published under an entirely wrong genus.

with *Viburnum obovatum* Walter, cannot stand as a valid name in the genus *Ilex* and for the same reason *Ilex peragua* Trelease based on *Cassine Peragua* Linnaeus (Mant. II. 220 [1771] which also represents *V. obovatum* Walt., must be rejected. These two names being excluded from the genus Ilex, *Ilex vomitoria* Aiton of 1789 remains the valid name for the species if we consider Miller's *Cassine paragua* a homonym of *C. peragua* Linnaeus.

Ilex Macfadyenii, comb. nov. — *Prinos montana* Swartz, Prodr. 58 (1788); Fl. Ind. Occ. I. 622 (1797).—*Prinos lanceolatus* Macfadyen, Fl. Jam. I. 206 (1837).—*Prinos Macfadyenii* Walpers, Rep. I. 541 (1842).—*Ilex montana* Grisebach in Mem. Am. Acad. Sci. Arts, n. ser. VIII. 171 (Pl. Wright. I) (1860); Fl. Brit. W. Ind. 187 (1864), not Torrey & Gray.—Loesener in Nov. Act. Leop-Carol. Akad. LXXVIII. 118 (Monog. Aquifol.) (1901).

West Indies.

Ilex montana Grisebach is preoccupied by *I. montana* Torrey & Gray (apud Gray, Man. 276 [1848]) which is the oldest name for *I. monticola* Gray (Man. ed. 2, 264 [1856]). Gray changed the earlier name *I. montana* on account of *Prinos montanus* Swartz but as at that time the combination under Ilex had not yet been made, the change was not necessary and is not in accordance with our present rules, therefore, *I. montana* Torr. & Gray remains the correct name for the species which is called generally *I. monticola* Gray. If, however, *I. montana* Gray and *I. mollis* Gray are considered varieties of the same species, *Ilex montana* becomes *I. dubia* var. *monticola* Loesener (in Nov. Act. Leop.-Carol. LXXVIII. 485 [Monog. Aquifol.] [1901]), as *Prinos dubius* G. Don. (Gen. Syst. II. 20 [1832]) is the oldest valid name for *I. mollis* Gray.

Euscaphis japonica var. **ternata,** var. nov.

A typo recedit foliis trifoliolatis foliolis ovatis majoribus.

China. Chekiang: South Yentang, *H. H. Hu,* No. 129, August 24, 1920.

As I have seen of this new form only a single fruiting branch with one pair of leaves which presents no other marked differences from typical *Euscaphis japonica* Dipp. except the 3-foliolate leaves and the larger ovate leaflets which are rounded at base and measure 7–9.7 cm. in length and 3.5–4.8 cm. in width, I hesitate to base a new species on such incomplete material, though the specimen presents a very distinct appearance. The leaflets are glabrous beneath except a few scattered hairs near the base of the midrib and a minute pilose pubescence on the petiolules of the lateral leaflets. The inflorescence is very large, about 15 cm. long excluding the peduncle which is 8 cm. long. Among the 43 specimens examined of *E. japonica* from China, Korea and Japan there is not a single specimen with 3-foliolate leaves except that occasionally the lower branches of the inflorescence are supported by one to 3 small leaflets.

Acer stenolobum (Sect. Platanoides), sp. nov.

Arbor vel frutex; gemmae pluriperulatae perulis ciliatis ramuli tenues, annotini brunneo-grisei, vetustiores grisei, lenticellis paucis parvis instructi. Folia profunde trilobata, 3–4.5 cm. lata et 2.5–3.5 cm. longa, base fere truncata lobis subaequilongis angulo circiter 60° divergentibus, anguste oblongo-lanceolatis 4–7 mm. latis marginibus fere parallelis, integris obtuse acuminatis vel apicem versus paucidentatis, subtus ad basin in axillis nervorum villosa et margine initio sparse ciliata, ceterum glabra, lacte viridia; petioli graciles 1.5–3 cm. longi, glabri. Flores andro-polygami, ut videtur lutescentes, graciliter et longe pedicellati, in corymbis glabris multifloris cum pedunculo gracili 1–2 cm. longo circiter 5 cm. longis et 3–4 cm. latis terminalibus in apice ramulorum foliis 4 instructorum; sepala 5, ovalia 1.5–2 mm. longa, obtusa, margine vel interdum tantum apice longe et sparse ciliata; petala lineari-oblonga vel oblonga, saepe inaequalia, sepalis subaequilonga vel paullo minora, glabra; stamina 5, inter lobos disci profunde lobati inserta, antheris ovalibus circiter 1–1.2 mm. longis; filamenta in floribus masculis sepalis duplo longiora, in flore fertili stamina sepalis subaequilonga; ovarium minute pilosulum; stylus ad medium fissus stigmatibus papillosis revolutis; in floribus masculis ovarium valde reductum stylis erectis brevibus basi connatis vel nullum; alae in fructibus juvenilibus suberectae basi vix constrictae et plus minusve incurvae. Fructus maturu desideratur.

CHINA. Shensi: west of Yenan Fu, *Wm. Purdom*, No. 337, 1910.

This very distinct species belongs in the section Platanoides Pax, but is easily distinguished from all other species of this group by the small deeply 3-lobed leaves with very narrow lobes of nearly equal length, the lateral ones wide-spreading and sometimes nearly horizontal. It seems nearest to *A. pictum* Thunb., *A. truncatum* Bge. and *A. tenellum* Pax, but differs from them not only in the shape of the leaves, but also in the 5 exserted stamens, in the puberulous ovary and in the longer style.

Acer cappadocicum Gled. f. **rubrum** Nash in Jour. New York Bot. Gard. XX. 87 (1919), nomen, as var.—*A. laetum* 2. *rubrum* Kirchner in Petzold & Kirchner, Arb. Musc. 193 (1864). *A. colchicum rubrum* Hort. ex Kirchner, l. c. (1864), as synon.—*A. laetum* var. *rubrum* Ruprecht in Mém. Acad. Sci. St. Pétersb. sér. 7, XV. no. 2, 281 (Fl. Caucas.) (1869).—*A. pictum* var. *rubrum* Nicholson in Gard. Chron. ser. 2, XVI. 375 (1881).—*A. Lobelii* subsp. *laetum* var. *colchicum* f. *horticola* Pax in Bot. Jahrb. VII. 237 (1886).—*A. laetum* var. *colchicum* 3. *rubrum* hort. apud Schwerin in Gartenfl. XLII. 459 (1893).—*A. laetum* var. *colchicum* f. *horticola* Pax in Engler, Pflanzenr. IV–163, 48 (1902).—*A. cappadocicum* f. *horticola* Rehder in Sargent, Pl. Wilson. I. 86 (1911).

As the correct combination for this form of *A. cappadocicum* was published by Nash without the citation of any synonyms, the synonyms are cited here to show that there can be no doubt that the varietal name *rubrum* and not *horticola* has the priority.

Acer Buergerianum Miq. var. **trinerve**, var. nov.—*A. trinerve* Hort. apud Dippel, Handb. Laubholzk. II. 428, fig. 200 (1892), excl. syn. *A. pycnanthum* K. Koch.—Pax in Bot. Jahrb. XVI. 393 (1982); in Engler, Pflanzenr. IV–163, 12 (1902), in part.—Koehne, Deutsch. Dendr. 376 (1893).—*A. trifidum* Hort. angl. ex Dippel, Handb. Laubholzk. II. 428 (1892), as synon.

This form differs from the type in its more deeply 3-lobed leaves, broader and often rounded or almost truncate at the base and with the lobes more strongly and unequally serrate, placed near or below the middle and spreading ,while in typical *A. Buergerianum* the lobes are placed above the middle and point more or less distinctly forward and the margin of the leaf is usually entire or nearly entire. Occasionally one finds, however, on specimens of typical *A. Buergerianum*, e. g. on F. N. Meyer's No. 1427, collected June 4, 1915 near Nanking (herb. Arnold Arb.), leaves which agree exactly with those of the variety. I have seen neither flowers nor fruit of this form which is apparently a juvenile form of typical *A. Buergerianum* as suggested already by Koehne, Pax and Spaeth (in Mitteil. Deutsch Dendr. Ges. 1896, 25). Under cultivation it seems to retain its juvenile character and it is therefore advisable to distinguish it by a definite name from the type.

In the Herbarium of this Arboretum there is a specimen collected by G. Nicholson in 1880 in the Kew Arboretum and labelled "*A. trinervum* Sieb." which seems to show that this form was originally introduced by Siebold.

Acer Opalus var. **tomentosum**, comb. nov.—*A. neapolitanum* Tenore, Fl. Napol. II. 372, t. 100 (1820); Mem. sugli Acere, 13, t. 4 (1846).—*A. opulifolium* var. γ *tomentosum* Tausch in Flora, XII. 549(1829).—Koch, Syn. Fl. Germ. 136 (1837), excl. "(β) lobis obtusis."—*A. obtusatum* var. *neapolitanum* Don, Gen. Syst.I. 649 (1831).—Pax in Bot. Jahrb. VII. 223 (1886), as subspec.; in Engler, Pflanzenr. IV 163,58 (1902).—*A. Opalus* var. *neapolitanum* Henry in Elwes & Henry, Trees Gt. Brit. Irel. III. 664, t. 106, fig. 15 (1908).

The oldest varietal name applicable to *A. neapolitanum* Tenore is that given by Tausch who, though he refers *A. neapolitanum* as well as *A. obtusatum* Kitaibel to his variety *tomentosum* considers *A. neapolitanum* the type of his variety, as he enumerates Tenore's species as (α) lobis acutis" and *A. obtusatum* Kitaibel as "(β) lobis obtusis." Therefore there can be no doubt that if these two species are considered two distinct varieties the varietal name *tomentosum* has to be applied to *A. neapolitanum*, while *A. obtusatum* becomes *A. opalus* var. *obtusatum* Henry in Elwes & Henry, Trees Gt. Brit. Irel. III. 663 (1908).

Acer Hersii (Sect. Macranthae), sp. nov.

Arbor gracilis ad 8 m. alta; ramuli ab initio glabri, virides vel annotini et biennes lutescentes, nitiduli, vetustiores longitudinaliter albo-striati; gemmae stipitatae, perulis 2 exterioribus valvatis obtectae, perulis 2

interioribus accrescentibus. Folia ambitu ovata vel late ovata, 3-lobata, raro minoribus indivisis immixtis, basi cordata, minora ovata lobis brevissimis acutis et 6–10 cm. longa et 4–7 cm. lata, majora late ovata lobis longioribus acuminatis interdum lobis basalibus parvis instructa et 8–14 cm. longa et 7–13 cm. lata, lobo medio triangulari-ovato longe acuminato, lobis lateralibus circa medium divergentibus brevissimis acutis vel latissime ovatis acuminatis et interdum ad 3 cm. longis, toto margine inaequaliter et dupliciter serrata dentibus latis brevibus mucronulatis, supra laete viridia, glabra, subtus basin versus ad venas initio ut petioli tomento ferrugineo lanuginoso caduco vestita, mox glabra; petioli graciles, 2.5–6 cm. longi; flores (hermaphroditi tantum visi) in racemis 15–20-floris cum pedunculo circiter 1 cm. longo 4–6 cm. longis glabris; pedicelli 2–4 mm. longi; sepala oblonga, 4 mm. longa et 1.5 mm. lata, obtusa; petala sepalis subaequilonga, obovata; stamina 8, sepala dimidia aequantia, antheris ovalibus 1.25 longis quam filamenta paullo longioribus; ovarium leviter ferrugineo-pubescens, mox glabrescens; stylus brevis, vix 1 mm. longus, stigmatibus recurvis multo longioribus. Fructus in racemis densis pendentibus; pedicelli 3–6 mm. longis; samarae 1.6–2.2 cm. longae, fere horizontales, alis leviter sursum curvatis loculo planiusculo circiter duplo longoribus.

CHINA. Honan: Teng Feng Hsien, Yu Tai Shan, Erh Tsu an, alt. 800 m., *J. Hers*, No. 219 (type) April 23, 1919; Sunghsien, Sankuanmiao, alt. 1200 m., *J. Hers*, No. 533 (co-type; immature fruits); May 24, 1919; Lushish, Lao kiun Shan, alt. 200 m., *J. Hers*, No. 1169, September 21, 1919; Tsi Yuan Hsien, Tien tan shan, *J. Hers*, No. 1739 (sterile), September 21, 1921. Chili: without locality, *Père Chanut*, 1919. Northern Shensi: Mt. Kiu-tou-san, *G. Giraldi*, July 14, 1897. North Central China: Mt. Kian-san, *Rev. Hugh*, 1897; "Thui-kio-tsuen," Mt. Kan-y-san" and Mt. Ngo-san, Rev. *Hugh*, 1899. Northern Hupeh "Ou-tan-scian," alt. 2050 m. *C. Silvestri*, No. 1370, September 1907; "Monte Kian-scian," alt. 2000 m., *C. Silvestri*, No. 1371, September 1907.

This new species belongs to the section Macranthae Pax and is closely related to *A. Davidii* Franch. and *A. laxiflorum* Pax. The first species is easily distinguished from it by the undivided, generally oblong-obovate leaves rounded or subcordate at the base and more densely rufous-pubescent beneath and on the petioles when young, and in the usually larger fruits on slenderer pedicels. The second species, *A. laxiflorum* Pax, differs from it chiefly in the caudate-acuminate, more closely and finely serrate leaves with acuminate teeth, glaucescent and glabrous beneath even when young and in the purplish and bloomy branchlets. Specimens of *A. Hersii* with larger more prominently lobed leaves have some resemblance to *A. tegmentosum* Maxim., but the leaves of that species are generally larger and broader with larger lateral lobes and a shorter middle lobe more sharply and doubly serrate with acuminulate teeth and glabrous even when young and the anthers are suborbicular.

This new Maple is named in honor of Mr. Joseph Hers to whom the Arboretum is indebted for extensive and interesting collections and seeds of Chinese woody plant chiefly from the province of Honan, a region

hitherto almost unknown botanically. The Chinese name of this Maple "tsin pi tuan" meaning "green bark Linden" refers to the conspicuous smooth green bark of the branches. Young plants of this species raised from seed sent by Mr. Hers are growing in this Arboretum.

Aesculus discolor var **Koehnei**, nom. nov.—*Aesculus humilis* Koehne Deutsch. Dendr. 386 (1893), not Loddiges.—Rehder in Bailey, Stand. Cycl. Hort. I. 228 (1914), as to description.—*A. Pavia* var. *humilis* Voss, Vilmorin's Blumengärt. I. 184 (1894), as to description, not Mouillefert.[1]—Rehder in Bailey, Cycl. Am. Hort. I. 32 (1900), as to description.—Schneider, Ill. Handb. Laubholzk. II. 252 (1909), as to description.

This variety differs from the type in its lower stature forming a shrub only a few feet high, smaller leaflets 6–12 cm. long and smaller panicles usually less than 10 cm. long. The origin of this form is unknown; it was first described by Koehne from cultivated plants growing in Spaeth's nursery near Berlin and plants received from the same nursery are now growing in this Arboretum.

Aesculus turbinata Bl. var. **pubescens**, var. nov.

A typo recedit foliolis subtus tota facie in costa venisque densius breviter villosis, petiolo praesertim apicem versus satis dense pilosulo.

JAPAN. Hondo: "in silvis Aomori," *U. Faurie*, No. 5022 (type), June 1902; Nikko, *C. S. Sargent*; Sept. 2, 1892; Mt. Buko, Musashi, *K. Sakurai*, June 9, 1903.

HOKKAIDO: Mororan, *C. S. Sargent*, September 14 and 25, 1892; common in moist woods, *E. H. Wilson*, No. 7057, July 2, 1914.

This variety differs in the soft pubescent under side of the leaves from the type which is described by Blume as having puberulous petioles and the under side of the leaflets glabrous except bearded in the axils of the veins and puberulous on the midrib and often on the veins. In the type specimen and in Sargent's specimen from Mororan, collected on September 2, the pubescence is so dense that it could almost be called tomentose, while in the other specimen it is less dense. In the Japanese specimens of *A. turbinata* before me the leaflets beneath are either quite glabrous with the exception of axillary tufts of hairs or they represent the

[1] *Aesculus Pavia* var. *humilis* Mouillefert, Arb. Arbriss. II. 709 (1894).—Voss, Vilmorin's Blumengärt. I. 184 (1894), excl. description.—Rehder in Bailey, Cycl. Am. Hort. I. 32 (1900) and in Bailey Stand. Cycl. Hort. I. 228 (1914), excl. description.—*Aesculus humilis* Loddiges apud Lindley in Bot. Reg. XII. t. 1018 (1826).—*Pavia humilis* G. Don apud Loudon, Hort. Brit. 143 (1830).—Sweet, Hort. Brit. ed. 2, 83 (1830).—G.Don, Gen. Syst. I. 653 (1831).—Spach, Hist. Vég. III. 31, (1834).—*Pavia rubra* **4.** *humilis* Loudon, Arb. Brit. I. 470 (1838).—*Aesculus Pavia* var. *nana* Dippel, Handb. Laubholzk. II. 404 (1892).

Of this form which is easily distinguished from *A. discolor* var. *Koehnei* by its narrower more deeply and irregularly serrate leaflets sparingly pubescent only on the veins and veinlets beneath I have seen specimens collected in 1880 by G. Nicholson in the Kew Arboretum under the names *Pavia rubra humilis pendula*, *Pavia pendula* and *Pavia pumila*, which agree well with Lindley's figures and his description of the pubescence of the leaflets as "subtus praecipue ad venas leviter pubescentia." As Loudon remarks his *A. rubra humilis pendula* (l. c.) is not a distinct variety, but only the var. *humilis* grafted high.

variety described above. The only specimens I have seen which agree exactly with Blume's description are specimens from trees cultivated at Kew, Segrez and in the former Ellwanger and Barry's nursery at Rochester, New York; the tree growing in this Arboretum has the petiole, midrib and veins glabrous, though it was raised from seed of the Rochester tree.

A plant received in 1913 from the nursery of H. A. Hesse in Weener, Germany, as *A. chinensis* has the leaflets densely pubescent beneath and belongs apparently to the variety here described.

Zizyphus jujuba Mill. var. **inermis,** comb. nov.—*Z. vulgaris* var. *inermis* Bunge in Mém. Sav. Etr. Acad. Sci. St. Pétersb. II. 88 (Enum. Pl. Chin. Bor. 14) (1833).—*Z. sativa* var. *inermis* Schneider in Sargent, Pl. Wilson. II. 212 (1914).

The oldest name under the genus Zizyphus of the tree named by Linnaeus *Rhamnus Zizyphus* is *Zizyphus jujuba* Miller (Gard. Dict. II no. 1 [1768]), which antedates *Z. sativa* Gaertner (1788) and *Z. vulgaris* Lamarck (1789). The name for the species called by Lamarck *Z. jujuba* becomes *Z. mauritiana* Lamarck (Encycl. Méth. III. 318 [1789]) which must be considered conspecific; the chief differences Lamarck gives "feuilles moins larges, fruits oblongs et pointus" are scarcely of specific value, for the size of the leaves varies greatly in the species and the fruits though usually subglobose are occasionally oblong and pointed as in Merrill's No. 2779 from the Philippines. It certainly is unfortunate that the name used for more than one hundred years in Lamarck's sense should be transferred to another species, but I do not see how this can be avoided under our rules of nomenclature. Miller's name *Z. jujuba* is the oldest name for *Rhamnus Zizyphus* L. under Zizyphus and when Lamarck transferred *Rhamnus jujuba* L. to Zizyphus his combination cannot be considered valid on account of the earlier homonym of Miller. Miller could not use the specific name given by Linnaeus, as it duplicated the generic name, and being at liberty to choose any other name he chose the name used by older authors for the same plant; as his species are not based on those of Linnaeus' Species plantarum he was under no obligation to accept the specific name jujuba for the same species as Linnaeus did under Rhamnus, a species not mentioned at all in Miller's enumeration of the species of Zizyphus.

Rhamnus Alaternus f. argenteo-variegata, comb. nov.—*Rhamnus-Alaternus communis* 3. *argenteo-variegatus* Weston, Bot. Univ. I. 237 (1770).—*Rhamnus alaternus* var. 6. *albo-variegatus* Dumont de Courset, Bot. Cult. ed. 2, v. 259 (1811).—*Rhamnus Alaternus* c. *foliis argenteis* Loudon, Arb. Brit. II. 530 (1838).—*Rhamnus Alaternus* var. *variegata* Bean, Trees & Shrubs Brit. Isls. II. 330 (1914).

This form which is apparently an old inhabitant of gardens is figured by F. Schmidt (Oesterr. Baumz. III. t. 156, upper figure [1800]); it has leaves bordered with a broad irregular white margin. A similar form,

R. Alaternus f. *aureo-variegata* Dumont de Courset (l. c., as var.—*Rhamnus Alaternus communis* 2. *aureo-variegatus* Weston, l. c.) with yellow-margined leaves is also figured by Schmidt on the same plate (lower figure).

×**Ceanothus pallidus** Lindley in Bot. Reg. XXVI. t. 20 (1840).—K. Brandegee in Proc. Calif. Acad. ser. 2, IV. 214 (1894). (? *C. Delilianus*[1] × *ovatus* = *C. americanus* × *coeruleus*[2] × *ovatus*).—*C. Fontanesianus* γ *cyaneus* Spach, Hist. Vég. II. 460 (1834).—*C. ovatus* 2. *flore cyaneo* H. Bollw. apud Kirchner in Petzold & Kirchner, Arb. Musc. 347 (1864).—*C. ovalis* × *thyrsiflorus* Koehne, Deutsch. Dendr. 396 (1893).—Schneider, Ill. Handb. Laubholzk. II. 292 (1909).—*C. hybridus pallidus* Rehder in Bailey, Stand. Cycl. Hort. II. 696 (1914).—*C. intermedius* Hort. ex Koehne, l. c. (1893), as synon.

For this plant which is apparently of hybrid origin, the parentage *C. ovatus* × *thyrsiflorus* has been suggested by Koehne and by Schneider, but I am unable to see any influence of *C. thyrsiflorus* Eschsch. There is no trace of the peculiar angular branches, of the rigid habit, the leathery leaves, the short pedicels and of other characters of that species perceptible in this plant, and, moreover, when this plant first appeared, *C. thyrsiflorus* was not yet introduced. There can be little doubt that *C. pallidus* Lindley is the same a Spach's *C. Fontanesianus cyaneus*, as Lindley states that his plant was received from Messrs. Baumanns of Bollviller under the name of C. *ovatus* and Spach says that his var. *cyaneus* was raised like the following variety by the Baumanns from seed of his *C. Fontanesianus* (*C. ovatus Desf.*).

[1] ×**Ceanothus Delilianus** Spach, Hist. Vég. II. 459 (1834).—K. Brandegee in Proc. Calif. Acad. Sci. ser. 2, IV. 213 (1894). (*C. americanus* × *coeruleus.*)—*C. americanus* var. *floribus subcoeruleis* Godefroy in Ann. Soc. Hort. Paris. V. 302 (1829).—*C. pulchellus* Delile in Hort. Monsp. ex Spach, l. c. (1834), as synon.—*C. Arnouldii* Carrière in Rev. Hort. 1872, 380.—*C. azureus* Lavallée, Arb. Segrez. 51 (1877), in part, not Desfontaines.—*C. azureus* var. *Arnoldii* Lavallée l. c. (1877).—*C. americanus* × *azureus* (*C. Arnouldii* h.) Koehne, Deutsch Dendr. 395 (1893).—Schneider, Ill. Handb. Laubholzk. II. 294 (1909).—*C. Dillenianus* Marchais in Rev. Hort. 1895, 351.—*C. hybridus* Hort. apud Rehder in Bailey, Cycl. Am. Hort. I. 265 (1900), in part.—*C. hybridus* "Arnoldii" Rehder, l. c. (1900).—*C. versaillensis* Schneider, Ill. Handb. Laubholzk. II. 294. (1909).

Judging from Spach's description I have no doubt that his statement that this plant is probably a hybrid of *C. azureus* is correct, and *C. americanus* is apparently the only species which could be the other parent. Therefore *C. Delilianus* will be the oldest binomial for the numerous hybrids raised between *C. coeruleus* Lag. (*C. azureus* Desf.) and *C. americanus*, of which may be cited as well known garden forms "Gloire de Versailles," "Léon Simon." "Sceptre d'azur," and "Le Géant."

[2] **Ceanothus coeruleus** Lagasca, Gen. & Spec. 11 (1816).—Loddiges, Bot. Cab. II. t. 110 (1821).—*C. azureus* Desfontaines, Tabl. Ecole Bot. ed. 2, 232 (1815), nomen nudum.—Ker in Bot. Reg. IV. t. 291 (1818).—K. Brandegee in Proc. Calif. Acad. Sci. ser. 2, IV. 193 (1894).—*C. bicolor* Humboldt & Bonpland apud Willdenow msc. in Roemer & Schultes, Syst. V. 300 (1819).

As pointed out already by Mrs. K. Brandegee (l. c.) the oldest valid name for this species is *C. coeruleus* Lag., as *C. azureus* Desf. published one year earlier is a nomen nudum.

The hybrid shows the influence of C. *ovatus* in the glabrous branchlets, the glabrous or nearly glabrous leaves and in their more oblong or elliptic not strictly ovate shape, while the blue color of the flowers must have come either from *C. coeruleus* or its hybrid with *C. americanus*, *C. Delilianus*. The scantiness or absence of pubescence and the rather large leaves with a tendency toward an ovate shape make it more likely that *C. Delilianus* is the other parent, for a cross with typical *C. coeruleus* would have produced a more pubescent plant with smaller distinctly oblong to elliptic leaves and a smaller inflorescence. The cross between *C. coeruleus* and *C. ovatus* may be represented by *C. Baumannii* Spach (Hist. Vég. II. 460 (1834)) of which I have seen no specimens.

× **Ceanothus pallidus** var. **roseus**, comb. nov.—*C. Fontanesianus roseus* Spach, Hist. Vég. II. 460 (1834).—*C. ovatus roseus* Carrière in Rev. Hort. 1875. 30, tab.—*C. azureus* var. *roseus* Lavallée, Arb. Segrez. 51 (1877).—*C. roseus* hort. (? *C. americanus* × *thyrsiflorus*) apud Koehne, Deutsch. Dendr. 395 (1893).—Schneider, III. Handb. Laubholzk. II. 294 (1909).—*C. hybridus roseus* Rehder in Bailey, Cycl. Am. Hort. I. 265 (1900).—*C. hybridus* Hort. ex parte, ex Schneider, l. c. (1909).

This plant as well as *C. pallidus* was raised by Baumann from seed of *C. ovatus* and is apparently of the same origin; in habit, pubescence and shape of leaves there is little or no difference and the variation in color is not an unusually occurrence, as blue, violet and lilac flowers often produce forms with pink, or rose-colored or even red flowers. To this hybrid belongs the form known as "Marie Simon" with flesh-colored flowers.

× **Ceanothus pallidus** var. **plenus**, comb. nov.—*C. flore albo pleno* Jouin in Rev. Hort. 1891, 110.—*C. americanus* var. *flore albo pleno* Grosdemange in Rev. Hort. 1893, 475.—*C. azureus* f. *flore albo pleno* Voss, Vilmorin's Blumengart. I. 179 (1894).—*C. hybridus* "Albus plenus" Rehder in Bailey, Cycl. Am. Hort. I. 265 (1900).—*C. albus plenus* Anon. in Gard. LXXVII. 432, fig. (1913).

This form is similar in habit, pubescence and shape of leaves to the preceding variety, but has double white flowers, pink in bud. Its origin is unknown to me, but it possibly originated before 1890 with Simon-Louis of Plantiéres near Metz, who raised many other hybrids of Ceanothus.

Vitis Thunbergii Sieb. & Zucc. var. **sinuata**, comb. nov.—*V. Labrusca* α-*typica* d. *sinuata* Regel in Gartenfl. XXII. 204, t. 765, p. 1, (1873). *Vitis Thunbergii* β *partita* Makino in Jour. Jap. Bot. I. 32 (1918).—*V. ficifolia* var. *Thunbergii* Nakai, Fl. Sylv. Kor. XII. 19, tab. 5 (1922), in part.

JAPAN: Buxen prov., *K. Sakurai*, August 17, 1910. KOREA. Quelpaert Island, common around Saishu on volcanic rocks, *E. H. Wilson*, No. 9371, October 28, 1917.

CULTIVATED SPECIMENS: Arnold Arboretum, September 7, 1921 (raised from seed of Wilson's No. 9371).

This variety differs from the type in the smaller, more deeply and usually 5-lobed leaves, with short and broad obtusish or rounded lobes

remotely and shallowly dentate or denticulate and much constricted below the middle by the wide rounded sinuses; on vigorous shoots the leaves are up to 8 cm. long, but on the flowering lateral branchlets they are usually only 3.5 to 5 or 6 cm. long. It has some resemblance to the Chinese *V. Thunbergii* var. *adstricta* (Hance) Gagnepain, but the leaves of that variety are more often 3-lobed and the lobes are acute or even acuminate. The rather small deeply divided leaves give to the plant a very graceful appearance and it is well worth cultivation as an ornamental vine.

Vitis Piasezkii Maxim. var. **Pagnuccii**, comb. nov.—*Vitis Pagnuccii* Romanet du Caillaud in Congress Geog. Toulouse (1884), ex Planchon in Vigne Amér. IX. 283 (1885).—Bailey, Cycl. Am. Hort. IV. 1956 (1902).—Schneider, Ill. Handb. Laubholzk. II. 302, fig. 206g-g^1 (1909).—Bean, Trees & Shrubs Brit. Isles, II. 674 (1914).—*Ampelovitis* Carrière in Rev. Hort. 1888, 537, fig. 134.—*Ampelovitis Davidi* Carrière, l. c. 1889, 204 tab.—*Ampelopsis Davidii* Mottet in Nicholson & Mottet, Dict. Prat. Hort. I. 138 (1892).—*Ampelovitis Davidiana* Carr. ex Bailey, Cycl. Am. Hort. IV. 195b (1902), as synon.—*Ampelopsis Davidiana* Mottet ex Bailey, l. c. (1902), as synon.—*Vitis Davidiana* Hort. ex Bailey l. c. (1902), as synon.

China. Shensi: Ho-chen-hao, alt. 1300–1400 m., *A. David* (type locality, ex Planchon). Hancheng Hsien, W. *Purdom*, No. 372, 1910. Hupeh: north and south of Ichang, thickets, alt. 700–1600 m., *E. H. Wilson*, No. 215 (in part as to the fruiting specimen), September 1907. Honan: Hweihsien, Shansi, border, *J. Hers*, No. 721, June 19, 1919; Lushih, Hiung-eul-shan, alt. 1300 m., *J. Hers*, No. 868, October 9, 1919; Tsi-yuan Hsien, Tien-tan-shan, *J. Hers*, No. No. 1796, September 21, 1921.

Cultivated specimens: Vineyard T. V. Munson, Denison, Texas, *T. V. Munson*, August 18, 1890. Arnold Arboretum, No. 4565 (plant received from Vilmorin-Andrieux & Cie., Paris), August 23, 1906 and September 13, 1912 and October 10, 1908.

This variety differs from the type chiefly in the absence of the floccose tomentum on the underside of the fully grown leaves and on the young branchlets, otherwise I can find no difference; the variability in the shape of the leaves and the inflorescence and fruit are just the same. Extreme forms, those of the type with dense grayish or tawny floccose tomentum on the more strongly reticulate under side of the leaves and those of the variety with glaucescent under side quite glabrous at maturity except axillary tuft of hairs, look certainly different enough to be taken as distinct species, but intermediate forms exist, as Wilson's Nos. 126a and 248 and Her's Nos. 1214 and 1364, also Wilson's No. 215 referred to the variety is slightly pubescent on the veins and not as glabrous as the cultivated plant introduced from France. The typical form seems to be prevalent in the southwestern part of the range of the whole species and the variety in the northeastern part; among the numerous specimens before me from Hupeh only Wilson's No. 215 has glabrescent leaves, while three of the specimens from northern Honan belong to the variety and two to

the type and even those are more or less intermediate and from Shensi only the variety is known.

Camellia elongata, comb. nov.—*Thea elongata* Rehder & Wilson in Sargent, Pl. Wilson. II. 392 (1915).

According to the International rules of nomenclature the name Camellia has to be adopted, if Camellia and Thea are not considered generically distinct, as the first author, who united the two genera—Sweet in 1818—chose Camellia as the name for the genus. This was first stated clearly by Dr. Cohen Stuart in his dissertation on Tea Selection (in Mededeel. Proefstat. Thee. XL. 328 pp, pl. [1916]), which includes a critical synopsis of all the species of the genus (l. c. 57–133 [1916], of which an English enlarged translation appeared in Bull. Jard. Bot. Buitenzorg, sér. 3, I. 193–320, pl. 21–31 [1919]). In a letter dated June 27th, 1922, Dr. Cohen Stuart calls my attention to two specimens not seen by my colleague and me when we described the species, collected by E. Faber on Mount Omei in 1887 which he refers to *Camellia elongata*, namely No. 76 (in herb. Kew and Berlin), and No. 345 (in herb. Kew), also an anomalous one, probably by Faber (in herb. Berlin); he adds: "No. 345 will be of special interest to you as it bears fruit. These are 14 mm. long, 11 mm. thick, pear-shaped, glabrous, opening from the apex with sharp-edged lobes; the seeds are too much shriveled to allow of a description."

Viburnum Sargentii f. **flavum**, forma nov.

A typo recedit fructi flavo, antheris flavis, foliis subtus tantum ad costam nervosque et saepe sparse ad venulas pilosis.

Cultivated at Highland Park, Rochester, New York, and at the Arnold Arboretum specimens examined: Highland Park, Rochester, New York, *J. Dunbar*, August 30, 1922.

This handsome form of *V. Sargentii* Koehne is distinguished from the type by its larger light yellow or amber-colored fruit pellucid when fully ripe, short-ellipsoidal or obovoid-ellipsoidal and 9–11 mm. long and 8–9 mm. across. In the pubescence of its leaves it is intermediate between the type and f. *calvescens* Rehder, being pilose chiefly on the midrib and veins only.

It was raised together with typical *V. Sargentii* at the Arnold Arboretum from seed sent in the autumn of 1904, by the Japanese botanist Uciyama from Korea to the Arboretum. Plants were sent latter to the Park Department at Rochester, New York, where it seems to have done better than in this Arboretum. It apparently fruits more profusely than the type and is indeed a striking plant when covered with its large pendent clusters of amber-colored fruit and seems superior as an ornamental shrub to *V. Opulus* f. *xanthocarpum*.

(*To be continued*)

TWO NEW ASIATIC POPLARS

Alfred Rehder

Populus Purdomii, spec. nov.

Arbor; ramuli juveniles teretes vel subteretes, glabri, annotini ochracei vel pallide flavo-brunnei; gemmae acutae, glabrae, viscosae. Folia ovata, vel anguste ovata, 10–13 cm. longa et 6–8.5 cm. lata, interdum ad 16 cm. longa et ad 13 cm. lata, ea turionum saepe oblongo-ovata ad 25 cm. longa et ad 15 cm. lata, acuminata, basi rotundata et plus minuse subcordata, margine denticulato-serrata vel crenato-serrata dentibus brevibus mucronulatis, supra glabra margine interdum ciliolato excepto, opace viridia nervis flavescentibus, subtus albescentia, sparse pilosula vel densius ad nervos et venulas, interdum glabra; nervis et nervulis distinctis elevatis; petioli 2.5–5 cm. long longi, ei turionum plerique paullo breviores. Amenta tantum fructifera visa, ad 11 cm. longa glabra; capsulae sessiles vel subsessiles, glabrae, globoso-ovoideae circiter 7 mm. longae, 2–3-valvae, basi perianthio parvo irregulariter lobato cinctae.

China. Shensi: Tai-pai-shan, *W. Purdom*, No. 1111 (type), 1910, No. 1110 (sterile), 1910. Southwestern Kansu: near Kagoba, alt. 2300–2600 m., *F. N. Meyer*, Nos. 1816, 1993, (sterile) October 30, 1914; Yin kuan dien, *F. N. Meyer*, No. 1945 (sterile), September 23, 1914. Also the following specimens seem to belong here: Szechuan: Lungan Fu, Tu-ti-liang-shan, alt. 2300-3000 m., *E. H. Wilson*, No. 4578, August 1910, west of Kuan Hsien, Pan-lan-shan, alt. 2600–3300 m., *E. H. Wilson*, No. 4346, October 1910.

Cultivated. Chico, Calif., Field Exper. Station of U. S. Department of Agriculture, under S. P. I. No. 39900 (from Kagoba,) *C. R. Howard*, April 2, 1916. Arnold Arboretum (plant received from Chico under S. P. I. No. 39900), *A. Rehder*, August 22, 1922.

This new species seems to be most nearly related to *P. suaveolens* Fischer and to *P. szechuanica* Schneider, but it differs from both in its prevailingly 2-valved capsules. In the shape and size of its leaves it resembles the latter, but the leaves are generally smaller and somewhat narrower, and the branchlets and even the more vigorous shoots are terete and not angled. From *P. suaveolens* it may be further distinguished by the larger, more coarsely glandular-serrate leaves always rounded and more or less subcordate at base and by the usually duller volored branchlets. The specimens from Shensi and Kansu have the under side of the leaves more or less pubescent but Purdom's No. 1110 is quite glabrous like the specimens from Szechuan; the pubescence, however, seems variable, as in Meyer's No. 1816, one leaf has the midrib, veins and veinlets distinctly pilose, while two other leaves attached to the same branch are glabrous and one is slightly pilose.

Photographs taken by F. N. Meyer near Kagoba in 1914, under Nos. 12170 and 13165, are in the collection of photographs of this Arboretum.

Populus Purdomii was introduced by F. N. Meyer, from Kagoba and subsequently distributed by the U. S. Department of Agriculture under

P. S. I. No. 39900 as *Populus Przewalskii*, but that species has according to the description elliptic leaves acute at base and only 3.5–5 cm. long and pubescent capsules becoming glabrate. In the cultivated plant of *P. Purdomii* the smaller leaves and those at the base of the shoots are slightly pilose beneath, those of the more vigorous shoots are nearly glabrous; on the upper surface they are dull green and rugulose and the midrib above and the petioles are red.

Populus koreana, sp. nov.

Arbor ad 25 m. alta; ramuli initio viscido-glandulosi, teretes, annotini pallide brunnei; stipulae triangulares, acuminulatae, 5–6 mm. longae et 3–4 latae; folia turionum elliptico-ovata vel elliptica ad ovato-oblonga, 7–15 cm. longa et 4.5–8.5 cm. lata, interdum majora, breviter acuminata, acumine rarissime torto, basi pleraque rotundata rarius subcordata, ea ramulorum brevium elliptica-oblonga vel oblongo-lanceolata, 4–12 cm. longa et 1.8–3.5 cm. lata, rarius majora, acuta vel acutiuscula, basin versus angustata et late cuneata vel rotundata, crenato-serrulata dentibus glanduloso-mucronulatis, supra rugulosa vel rugosa, glabra vel initio ad costam mediam puberula intense viridia, subtus albescentia, glabra vel interdum in foliis ramulorum brevium ad costam et venas ut petiolus minute pilosula; petioli 0.5–1 cm. longi, glabri, in ramulis brevibus ad 1.5 cm. longi et interdum minute pilosuli. Flores et fructus non visi.

KOREA. North Heian; foot of Mt. Hakuba ,side of streams, *E. H. Ison, Wi* No. 8822 (type) July 24, 1917; Pakadong, Yusan district, *E. H. Wilson*, No. 10669, September 1, 1918; from around Shingishu on Yalu River, cultivated at forestry station, *E. H. Wilson*, No. 8787, July 16, 1917. North Kankyo: Funei, side of streams, abundant, *E. H. Wilson*, No. 8890, August 14, 1917; Mozan to Jyosohya, water-courses, not common *E. H. Wilson*, No. 8935, August 17, 1917.

Cultivated: Arnold Arboretum, under No. 10825; specimens collected: October 28, 1920, September 20, 1921.

Though the flowers and fruits of this new Poplar are unknown it is so distinct in its vegetative characters that there can be no doubt, that it represents an undescribed form. It is apparently most nearly related to *P. Maximowiczii* Henry and I was at first inclined to consider it a variety of that species, but Mr. Wilson who paid special attention to the Poplars while in Korea says that it is quite different from *P. Maximowiczii* and always easily distinguished chiefly by its viscid-glandular young shoots, and that it is a smaller tree of different habit and of more southern distribution. From this new species *P. Maximowiczii* differs chiefly in its puberulous young branchlets, glabrous but not viscid-glandular only in younger seedling plants, in the broader leaves more or less pubescent beneath, rounded or subcordate at base and nearly always with a peculiar twist at the apex, in the generally longer puberulous petioles and in the brighter yellow or orange-yellow color of the mature branchlets. The third Korean species, *P. Simonii* Carrière, produces sometimes on vigorous shoots larger leaves which resemble those of the other two species, but it

is always easily distinguished by the glabrous angular shoots and the perfectly plane and smooth upper surface of the leaves.

Young plants of *P. koreana* raised from cuttings brought by Mr. Wilson from Korea, are growing in this Arboretum and are very handsome with their large bright green leaves marked with a conspicuous red midrib and nearly white on the under side.

BIBLIOGRAPHICAL NOTES

ETHELYN M. TUCKER

Nouveau Duhamel. Upon the publication of my note on "Nouveau Duhamel" in this *Journal* vol. ii, no. 3, I received a letter from Miss Alice Atwood of the Bibliographical staff of the Department of Agriculture at Washington, calling attention to references which had escaped my notice, which seem to prove that the work appeared in 83 livraisons instead of in 80 as stated by me, and that volume i was published from 1800 to 1801. To quote in part from this letter: "An article by Bouchard-Huzard 'Note bibliographique sur le Traité des arbres et arbustes et sur le Traité des arbres fruitiers, par Duhamel du Monceau' in the *Journal de la Société impériale et centrale d'horticulture de France*, v. 12, 1866, states on pages 472–473 that the work appeared in 83 livraisons (1800–1819). Konig and Sims' *Annals of botany*, vol. i. no. 1, p. 69 in the 'Retrospect of botanical literature for 1801-03' speaks of the new edition of Duhamel's Traité, begun in 1800." From these references and others since discovered it seems clear the "Nouveau Duhamel" was issued in 83 livraisons from 1800 to 1819. I gladly take the opportunity to make this correction.

Mouillefert. Traité des arbres & arbrisseaux. From a bibliographical point of view it is always of interest to know the form in which a work originally appeared; if in parts, coming out at more or less irregular intervals during a number of years, when those parts were issued, how many pages they contained, whether there were covers, and whether those covers gave dates, which unfortunately they often do not. In the case of botanical works it is of great importance as involving questions of priority, and it is quite deplorable that in the majority of cases when such volumes are bound the covers are destroyed and valuable information lost altogether or recovered at the expenditure of much painstaking labor and time. Mouillefert's "Traité des arbres & arbrisseaux forestiers, industriels et d'ornement cultivés ou exploités en Europe et plus particulièrement en France donnant la description et l'utilization de plus de 2400 espèces et 2000 variétés," issued in 38 parts, is bound in 3 vols., without covers. Texte, partie 1 (Rénunculacées à Légumineuses) 688 pp.; partie ii (Térébinthacées à Graminées) pp. 689–1403; and Atlas, 195 plates. Paris. 1892–

1898. It would be interesting to learn whether there were covers as originally issued, and if so, whether those covers were dated. Singularly enough Just's *Botanischer Jahresbericht* makes no mention of Mouillefert's "Traité" until the announcement of the complete work in 1898.

While not containing new species the "Traité" is interesting as giving many new varieties and it is gratifying to be able to quote dates and pages of parts as given in a letter written to Mr. Alfred Rehder by the publisher Paul Klincksiek, August 19, 1903, in response to a request for them for the Arboretum copy

Part	1	signatures	1–2	Jan. 7, 1891
"	2	"	3–4	Jan. 28, 1891
"	3	"	5–6	Mar. 7, 1891
"	4	"	7–8	Mar. 31, 1891
"	5	"	9–10	July 15, 1891
"	6	"	11–12	July 15, 1891
"	7	"	13–14	July 15, 1891
"	8	"	15–16	July 30, 1891
"	9	"	17–18	Nov. 24, 1891
"	10	"	19–20	Nov. 24, 1891
"	11	"	21–22	Jan. 12, 1892
"	12	"	23–24	Mar. 5, 1892
"	13	"	25–26	April 23, 1892
"	14	"	27–28	July 8, 1892
"	15	"	29–30	Nov. 19, 1892
"	16	"	31–32	May 16, 1893
"	17	"	33–34	Aug. 18, 1893
"	18	"	35–36	Oct. 7, 1893
"	19	"	37–38	Mar. 13, 1894
"	20	"	39–40	Mar. 13, 1894
"	21	"	41–42	June 11, 1894
"	22	"	43–44	Oct. 2, 1894
"	23	"	45–46	Jan. 7, 1895
"	24	"	47–48	April 23, 1895
"	25	"	49–50	Aug. 12, 1895
"	26	"	51–52	Aug. 12, 1895
"	27	"	53–54	Dec. 28, 1895
"	28	"	55–56	Feb. 20, 1896
"	29	"	57–58	July 7, 1896
"	30	"	59–60	Sept. 18, 1896
"	31	"	61–62	Dec. 3, 1896
"	32	"	63–65	Feb. 20, 1897
"	33	"	66–69	Aug. 4, 1897
"	34	"	70–73	Nov. 6, 1897
"	35	"	74–77	Jan. 10, 1898
"	36	"	78–81	Mar. 2, 1898

Part 37	signatures	82–85	June 8, 1898	
" 38	"	86–88	Oct. 5, 1898	(containing title and indexes for text and plates).

From this citation it appears that nearly one half of vol. i (pages 1–320) was issued in 1891, a year earlier than the date upon the title page.

Voss. Vilmorin's blumengärtnerei. The full title of this well-known work reads: "Vilmorin's Blumengärtnerei; beschreibung, kultur und verwendung des gesamten pflanzenmaterials für deutsche gärten. Dritte, neubearbeitete auflage unter mitwirkung von A. Siebert, herausgegeben von A. Voss. Mit 1272 textabbildungen und 400 bunten blumenbildern auf 100 farbendrucktafeln." 2 bde. Berlin. 1896. Bd. 1, pp. viii, 1264; bd. 2, pp. 244, 78.

Though published as a third edition to "Vilmorin's Illustrierte blumengärtnerei," it may be regarded as an entirely new work, having little in common with the first and second editions except the title. The preface in bd. 1 states that the task of editing a new edition of Vilmorin's celebrated "Blumengärtnerei," of which two editions of many thousands of copies have been distributed among gardeners and plant lovers, is an extraordinarily difficult one, the more so as the publisher, Dr. Parey, wishes to present more than a revision and a supplement. Instead of the original alphabetical arrangement of botanical names he proposes an arrangement by families and genera and an enlargement from the entire plant material in German gardens. In order to do this the editor, A. Voss, spent many months in practical study in the Frankfurt Palmgarden, in Stuttgart, Berlin, etc., and after six years labor the work is brought to a close. In regard to nomenclature the work is much more thorough and exact than most works on the botany of cultivated plants; the author, as a follower of O. Kuntze, has tried to apply consistently the law of priority and therefore found it necessary to create a considerable number of new names and new combinations, chiefly of varieties. To fix the date of publication of these new names the statement is made in the preface that bd. 1 was "im druck von neujahr 1894 bis August 1895." To make the date of the appearance of the first part more specific, we find in *Gartenflora* for April 1894, p. 223, that the first heft of the work which has been in preparation for many years has at last appeared, and that the entire work in 2 vols. will be issued in 50 lieferungen. *Gartenflora* also adds that of the original work little remains, but the name and many "clichés." While the original contained only plants growing in the open air, the new work includes exotic and hot house plants. *Botanische zeitung* for June 1, 1894, on page 176, states that lieferung 1 consists of 48 pages.

On the reverse of the title-page of bd. 1 of the Arboretum copy is written in pencil, "Published in 50 parts, one every two weeks. Pages 1–832 published in 1894; pp. 833–1264 in 1895." Though diligent search has failed to reveal the source of this information it is believed to be

correct as it was added by Mr. Alfred Rehder in compiling the Bradley Bibliography, and it is more than likely that it was obtained from the editor himself.

The dates of band 2 of "Blumengärtnerei" concern us but little since it contains no new names and no descriptions, but it is interesting to find in *Botanische zeitung* for Dec. 16, 1895, on page 391 the announcement of pages 1–128; it was doubtless completed in 1896 the date of the preface and the title-pages.

Willmott. The Genus Rosa. Recognized in every age and in all countries as the Queen of flowers, the rose has been the subject of much literature. Among the many books of roses of recent years Miss Ellen Willmott's "Genus Rosa, drawings by Alfred Parsons," stands out preeminently, by virtue of its comprehensiveness, the accuracy of descriptions and the delicacy and beauty of its colored plates. In her preface Miss Willmott says "I have aimed principally at giving all the evidence I could collect from every available source. I can hardly hope to have presented many facts not mentioned by previous writers, but I have at least taken great pains to ensure accuracy, and to verify and give references for every statement I have made." To this carefully collected evidence are added not a few descriptions of new species, especially of Chinese roses by J. G. Baker.

The covers of the twenty-five parts in which the work was issued from 1910 to 1914, are a joy and delight alike to the cataloguer, bibliographer and to the student of roses, giving the year in which each part was published (pts. vii–xxv have also month and day), and on the back cover of the last part a concise list of all the parts with month and day of the appearance of each.

Perhaps in some libraries "The Genus Rosa" may exist only as two bound volumes, paged continuously, without covers, the title-page of each bearing the date 1914, and the only indication of an earlier date being an additional title-page for 1910 in volume i, which by itself is a little confusing.

It seems therefore worth while to put full information on record, in in the hope that it may help some lover of Roses.

Vol. i

Pt.	1	pp.	i–viii, 1–22	September	15,	1910
"	2	"	23–42	October	19,	"
"	3	"	43–56, i–xxvi	November	14,	"
"	4	"	57–76	December	14,	"
"	5	"	77–100	January	14,	1911
"	6	"	101–132	February	14,	"
"	7	"	133–156	March	14,	"
"	8	"	157–174	April	12,	"
"	9	"	175–196	May	12,	"

Pt.	10	pp.	197–210	June	14, 1911
"	11	"	211–230	July	14, "
"	12	"	231–244	August	14, "

Vol. ii

Pt.	13	pp.	245–266	September	20, 1911
"	14	"	267–280	October	13, "
"	15	"	281–300	November	14, "
"	16	"	301–322	December	14, "
"	17	"	323–340	January	15, 1912
"	18	"	341–358	February	24, "
"	19	"	359–376	April	4, "
"	20	"	377–396	June	7, "
"	21	"	397–414	June	26, "
"	22	"	415–446	July	16, "
"	23	"	447–466	September	19, "
"	24	"	467–482	October	19, "
"	25	"	483–552, ix–xvi,xxvii	March	14, 1914

From the foregoing citation it is seen that though the volumes are dated 1914, part xxv is the only one which was not actually published previous to that date.

ERRATA AND ADDENDA

Page 14, line 8 for 1928 *read* 1828
" 15, line 8 for in *read* before
" 16, line 13 from below for **glandulosa,** comb. nov. *read* glandulosa Farwell in Rep. Mich. Acad. Sci. XXI, 366 (1920).
" 74, line 1 under No. 75 for Fernald *read* Fernald & Wiegand[1]
" 86, under CONNECTICUT *add* pedicellaris *and* serissima
" 87, under MAINE *strike out* candida *and add* pedicellaris *and* pyrifolia
" 87, under MASSACHUSETTS *omit* amygdaloides
" 88, " VERMONT *omit* amygdaloides *and add* pedicellaris
" 89, " LABRADOR *add* reticulata
" 89, " NEW BRUNSWICK *add* glaucophylloides *and* longifolia
" 90, " NEWFOUNDLAND *add* arctophila,* cryptodonta, pedicellaris *and* serissima
" " lines 2–3 for brachypoda *read* brachycarpa
" " under QUEBEC *for* chlorolepis *read** chlorolepis *and for* fuscescens var. hebecarpa *read* fuscescens var.* hebecarpa *and add* brachycarpa *and* pedicellaris
" 94, lines 1–3 above footnote 1 should be stricken out
" 95, lines 1–6 from above should be stricken out

[1] For this and the following corrections we are indebted to Professor M. L. Fernald.

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MICHAUX'S EARLIEST NOTE ON AMERICAN PLANTS

ALFRED REHDER

IN the year 1792 a note by A. Michaux on some rare and new plants of North America edited with critical observations by Lamarck was published on pp. 409–419 of volume I of the "Journal d'histoire naturelle rédigée par MM. Lamarck, Bruguière, Olivier, Haüy et Pelletier." This journal which was discontinued after volume II. seems to be very rare and Michaux's note has been therefore generally overlooked and neglected; only part of the new names are found in the Index Kewensis and only a few of them are mentioned in monographs and publications on American plants even when it had been the intention of the author to give a complete enumeration of synonyms. As Michaux's note, which is interesting as one of the earlier publications on American plants, is at present not accessible to the majority of American botanists, an exact reprint of the comparatively short article may follow here with the omission of the remarks of Lamarck on Michaux's activities as collector and traveler:

p. 409 Notice de quelques plantes rares ou nouvelles observées dans l'Amérique Septentrionale, par M. A. Michaux; adressée à la Société d'Histoire Naturelle de Paris par l'auteur; et rédigée, avec des observations.

Par M. Lamarck.

Plantes remarquées en Amérique.

Monandrie.

1. Canna *Flava.* Cette plante habite les bords des rivières en Géorgie et en Floride.

Diandrie.

2. Pinguicula *Lutea.*
3. Pinguicula *Violacea.*

Ces deux espèces n'ont pas été decrites, et se trouvent dans la Caroline.

4. Salvia *azurea.* Nouvelle sauge de six pieds de haut. On la trouve sur les rives de la rivière Sainte-Marie, en Géorgie.

Tetrandrie.

5. Ilex *Americana.*
6. Ilex *Cassine.*
7. Ilex *Augustifolia* [*sic*].
8. Ilex *Cassena vera.*
9. Ilex *Æstivalis.*

Tous les ilex d'Amérique sont dioïques. Dans l'ordre naturel, les deux dernières espèces n'ont point d'affinité avex les trois autres.

Pentandrie.

p. 410 10. Azalea *Fulva.* C'est une variété de l'Azalea nudiflora.

11. Azalea *Pilosa;* floribus octandris, corollis ovatis, capsulis oblongis angulatis. Folia pilosa, ad apices nivea.

Cet arbrisseau habite les plus hautes montagnes de la Caroline, vers les sources de la rivière Catawba.

12. Ipomæa *Erecta,* foliis pinnatifidis.

Se trouve sur les bords de la mer, en Floride.

13. Mussænda *Frondosa.*

Corolla infundibuliformis. Capsula ovata, bilocularis. Cet arbrisseau me paroit dans l'ordre naturel avoir de l'affinité avec le quinquina. Les habitans de la Géorgie
p. 411. en font, en effet, usage comme du quinquina contre les fièvres. J'ai transporté dans le jardin de la Caroline, plusieurs plants de cet arbrisseau, qui y ont éprouvé un froid de six à huit degrés sans en être endommagé.

Octandrie.

14. Vaccinium *Ciliatum.*

Caulis erectus, foliis ciliatis. Corolla profunde quadripartita, laciniis revolutis. Stamina octo.

Cet arbrisseau habite le sommet des plus hautes montagnes de la Caroline septentrionale. Il est à remarquer que c'est la seule espèce connue en Amérique, ayant huit étamines.

15. Lapathum *Occidentale.*

Cet arbrisseau de la Géorgie en Amérique, a la plus grande affinité avex le Lapathum orientale observé par Tournefort dans la Géorgie Asiatique. Celui d'Orient, que j'ai vu en Perse, a huit étamines; et celui d'Amérique en a constamment dix.

Enneandrie.

Laurus *indica.* L'on a souvent cité pour *Laurus indica*
p. 412 une variété du *L. borbonia* à feuilles glabres, qui se trouve en Caroline. Le *Laurus indica* designé par Catesby, *cornus ad,* etc. ne se trouve qu'aux isles Bahame et aux parties méridionales de la Floride.

Decandrie.

16. Rhododendron *minus*, foliis minoribus ellipticis petiolatis subferrugineis.
    Se trouve sur les rives de la rivière de Savanah.
17. Kalmia *hirsuta;* foliis hirsutis.
    On le trouve dans la Géorgie et la Floride.
18. Kalmia . . . foliis alternis in petiolum desinentibus: margine reflexis; floribus aggregatis; corollis niveis fundo roseis.
19. Andromeda *polifolia;* foliis Rosmarini.
    Habite les montagnes de la Pensylvanie.
20. Andromeda *calyculata.*
21. Andromeda *paniculata.*
    Il y a plusieurs variétés de cette expèce.

p. 413

22. Andromeda *racemosa;* floribus secundis, calycibus calyculatis.
23. Andromeda *mariana.*
24. Andromeda *arborea.*
25. Andromeda *Wilmingtonia;* foliis ovatis crenatis, corollis cylindricis.
26. Andromeda *axillaris;* foliis perennantibus, calycibus calyculatis.
27. Andromeda *nitida.*
28. Andromeda *ferruginea.*
29. Andromeda *formosissima.* Voyez Bartram Stravel [*sic*].

Diadelphie.

30. Robinia *viscosa.*
    Grand arbre des montagnes de la Caroline.

Polygamie.

31. Nyssa *montana;* foliis villosis.
32. Nyssa *aquatica;* foliis glabris.
33. Nyssa *dentata;* foliis denticulatis.
34. Nyssa *tomensosa* [*sic*] (ogechee de Bartram) foliis tomentosis incanis.

p. 416

Remarques sur quelques-unes des plantes de la notice ci-dessus.

No. 1. Ce *Canna flava* est-il vraiment différent du *Canna glauca.* L. qui croit dans la Caroline, qui a aussi les fleurs jaunes, mais pâles, et qui ne les a point ponctuées, comme la variété du *Canna indica* a fleurs jaunes, que j'ai citée dans mon dict. Voyez *Balisier,* no. 1, var. B.

No. 2. *Pinguicula lutea.* C'est vraisemblablement la même plante que celle dont j'ai donné la description dans le n°. 9 de ce Journal (pag. 334, pl. 18, fl. 1), sous le nom de *Pinguicula campanulata.*

No. 5. *Ilex Americana.* C'est peut-être le même que j'ai publié dans mon dict. sous le nom d'Ilex laxiflora. Voyez *Houx*, n°. 3.

No. 9. *Ilex æstivalis.* Si c'est la même plante que celle que j'ai
p. 417 decrite sous le même nom dans mon dict. Elle est fort voisine des Prinos, et je pense même que c'est le *Prinos lucidus* de l'*Hortus kewensis*, pag. 378. Voyez le *Tableau des Houx*, dans mon Illustr. des genres.

No. 12. . . . Cet Ipomaea pourroit bien être le même que l'*Ipomaea rubra* de Linné, que je crois être une espèce de Cantua. Voyez Cantu, dans mon dict.

No. 13. *Mussænda frondosa.* Je doute fort que cet arbrisseau de la Géorgie soit le même que celui des Indes orientales, qui porte le même nom, et dont les fruits sont pulpeux. Gaertn. les a figurés (t. 28, f. 5).

No. 17. *Kalmia hirsuta.* Il y a apparence que c'est l'arbuste que j'ai décrit sous le même nom, d'après des exemplaires secs que je possède de la Caroline, et qui m'ont été communiqués par M. Fraser. Voyex Kalmie *velue*, n°. 3, dans mon dict. vol. 3, p. 34[illegible].

No. 23. *Andromeda mariana.* Cette belle espèce, dont j'ai donné la description dans le premier volume de mon dict. (p. 156, n°. 8), a été depuis figurée par M. Vogel (*ic. rar. tab.*
p. 418 107, f. 1); mais l'*Andromeda mariana* de M. Jacquin (*collect. vol.* 2, p. 326, ic. rar. vol. 2) est tout autre chose. C'est une nouvelle espèce que j'ai décrite le premier dans le 1[er]. volume de mon dict. sous le nom *d'Andromeda lucida*, n°. 9. Il y a apparence que cette espèce est la même que *l'Andromeda coriacea* de l'*Hort. kewensis*, et que *l'Andromeda nitida*, n°. 27 de cette notice.

No. 29. *Andromeda formosissima.* Je crois que cette andromède est la même que j'ai nommée *Andromeda populifolia* (dict. vol. 1, p. 159, n°. 14) et que depuis M. Jacquin a décrite et figurée sous le nom *d'Andromeda lucida* (*collect. vol.* 1, p. 95, *et ic. rar. vol.* 1.). Enfin, depuis M. Jacquin, cette même plante a été mentionnée dans l'Hortus kewensis, sous le nom d'*Andromeda acuminata.* Quelle confusion ne doit pas produire cette mutation continuelle dans les noms assignés aux plantes par ceux qui en ont traités les premiers?

Au reste, pour terminer les observations que j'ai à faire sur le succès des recherches de M. Michaux, je dirai que j'ai connoissance
p. 419 de plusieurs plantes intéressantes qu'il a decouvertes, et dont il ne fait point mention dans la notice exposée ci-dessus. D'ou je conclus que cette notice, quoique déjà interessante par les objets qu'elle indique, est bien éloignée de donner une idee complette de tous les services que M. Michaux rendra a la Botanique, et même

à toutes les parties de l'Histoire Naturelle, par les observations et les découvertes qu'il a faites et qu'il continue de faire dans ses voyages.

REMARKS ON THE NAMES IN MICHAUX'S NOTE

1. *Canna flava.* This can not be any other species than *C. flaccida* Roscoe (in Trans. Linn. Soc. VIII. 339 [1807]), to which it is referred in Index Kewensis. As it is a nomen nudum, Roscoe's name will stand. No Canna is described in Michaux's Flora.

2. *Pinguicula lutea* is the *P. lutea* Walter of Michaux's Flora (I. 11), of which *P. campanulata* Lamarck is a synonym.

3. *Pinguicula violacea* is probably *P. pumila* of Michaux's Flora (I. 11) the flower of which is described as "pallide violacea." Not cited in Index Kewensis.

4. *Salvia azurea.* This name as published here must be considered a nomen nudum and for the first valid publication of it credit should be given to Vahl (Enum. Pl. I. 253 [1805]); Lamarck's publication of the name, though volume VI. of the Encyclopédie Méthodique bears the date 1804, is later, as shown by the fact that he quotes Vahl's description; in volume VI. as in other volumes of the Encyclopédie the date of the title page is correct only for the first part of the volume, while the second part was not published until the following year. Vahl's work came out probably early in 1805, if not at the close of 1804, as the preface is dated July, 1804. This Sage was first described by Walter in 1788 who identified it erroneously with *S. mexicana* of Linnaeus and again in 1800 by Ventenat (Descr. Pl. Jard. Cels. 50 t. 50) under the name *S. acuminata,* a name preoccupied by *S. acuminata* Ruiz & Pavon; Vahl quotes Ventenat's name as *S. acuminatissima,* an erroneous citation repeated by several later authors.

5. *Ilex americana* is according to Lamarck's note probably the same as his *I. laxiflora* which is a synonym of *I. opaca* L. under which it appears in Michaux's Flora (II. 228). *Ilex americana* is not mentioned in Index Kewensis, but Loesener (Nov. Act. Carol.-Leop. Acad. LXXVIII. 152 [1901]) cites it as a synonym of *I. opaca.*

6. *Ilex Cassine* is without doubt *Ilex Cassine* L. which appears in Michaux's Flora as *I. Dahoon* Walter.

7. *Ilex angustifolia* is probably the Ilex which appears in Michaux's Flora as *I. myrtifolia* Walter and is now generally referred to *I. Cassine* as var. *myrtifolia* Sargent. To judge from the description in Michaux's Flora it is not the *I. angustifolia* Willdenow (Enum. Pl. Berol. I. 172 [1809]) which is *I. Cassine* var. *angustifolia* Aiton.

8. *Ilex Cassena vera* is *I. Cassena* of Michaux's Flora (II. 229) which is *I. vomitoria* Aiton.

9. *Ilex aestivalis* is apparently the same as *I. aestivalis* Lamarck (Encycl. Méth. III. 147 [1789]) which is according to Poiret (Suppl. Encycl.

Méth. III. 65 [1813]) identical with *I. prinoides* Aiton of Michaux's Flora (II. 229), a synonym of *I. decidua* Walt.

10. *Azalea fulva* is apparently *A. calendulacea* var. α *flammea* of Michaux's Flora (I. 151) which has been referred by me (in Wilson & Rehder, Monog. Azaleas, 131 [1921]) to *Rhododendron speciosum* (see also l.c., foot-note 2).

11. *Azalea pilosa* is *Menziesia Smithii* of Michaux's Flora for which the correct name is *Menziesia pilosa* Jussieu.

12. *Ipomoea erecta.* This is apparently the plant described in Michaux's Flora (I. 142) as *Ipomopsis elegans* and now referred to the genus Gilia as *G. rubra* Hell. (*G. coronopifolia* Pers.). The name does not appear in Index Kewensis where only *I. erecta* R. Br. is cited; R. Brown's name will not be invalidated by the earlier homonym, as the latter is a synonym of the still earlier *Polemomium rubrum* L. which is now *Gilia rubra* Heller.

13. *Mussaenda frondosa* is an earlier name for *Pinckneya pubens* of Michaux's Flora (I. 105), but the name is not valid as there is an older *Mussaenda frondosa* of Linnaeus. *Mussaenda frondosa* Michaux is not cited in Index Kewensis nor is it mentioned as a synonym of *Pinkneya pubens* in Sargent's Silva or in the North American Flora.

14. *Vaccinium ciliatum.* This is the oldest name for *V. erythrocarpum* of Michaux's Flora (I. 227) but as there exists the older valid name *V. ciliatum* Thunberg, *V. erythrocarpum* will stand. *Vaccinium ciliatum* Michaux is not in Index Kewensis and is not mentioned in Gray's Synoptical Flora.

15. *Lapathum occidentale* is without doubt *Cliftonia monophylla* Britton. Lapathum is a Tournefortian genus referred by Linnaeus to Rumex, but Tournefort's *Lapathum orientale* with which Michaux compares our species is *Atraphaxis frutescens* K. Koch (*Polygonum frutescens* Linnaeus). The similarity of the fruit which has given rise to the vernacular name "Buckwheat-tree" for Cliftonia apparently led Michaux to refer our plant to the same genus as *Lapathum orientale* which he had observed in Persia. The name *Lapathum occidentale* is not mentioned in Index Kewensis and the plant is not described in Michaux's Flora.

* *Laurus indica* is apparently the *Laurus Catesbyana* of Michaux's Flora (I. 244) now *Ocotea Catesbyana* Sargent, while the glabrous variety found in Carolina of *Laurus borbonia* which Michaux says is often erroneously called *L. indica* is the *Laurus carolinensis* of his Flora (I. 245) now referred to *Persea borbonia* Sprengel.

16. *Rhododendron minus* is *R. minus* of Michaux's Flora (I. 258) and is the oldest name for *R. punctatum* Andrews as stated by me in 1912 (Rhodora, XIV. 100).

17. *Kalmia hirsuta* is *K. hirsuta* Walter of Michaux's Flora (I. 257).

18. *Kalmia* . . . is apparently the *K. cuneata* of Michaux's Flora (I. 257).

19. *Andromeda polifolia* is apparently *A. glaucophylla* Link, as Michaux gives the mountains of Pennsylvania as the habitat of the species; in his

Flora (I. 254) he cites only mountains near Hudson Bay, which is the region for the true *A. polifolia* Linnaeus.

20. *Andromeda calyculata* is *A. calyculata* Linnaeus of Michaux's Flora (I. 254) which is now *Chamaedaphne calyculata* Moench.

21. *Andromeda paniculata* is the *A. paniculata* of Michaux's Flora (I. 254) for which he cites erroneously Linnaeus as the author. It is now *Lyonia ligustrina* (L.) DeCandolle.

22. *Andromeda racemosa* is *A. racemosa* Linnaeus of Michaux's Flora (I. 255) now *Leucothoe racemosa* Gray.

24. *Andromeda arborea* is *A. arborea* Linnaeus of Michaux's Flora (I. 255), now *Oxydendrum arboreum* DeCandolle.

23. *Andromeda mariana* is *A. mariana* Linnaeus of Michaux's Flora (I. 256), now *Lyonia mariana* D. Don.

25. *Andromeda wilmingtonia.* This name does not appear in Michaux's Flora and is not enumerated in Index Kewensis. Though the description is very short, and partly, as to the description of the shape of the corolla, misleading, there can be hardly a doubt that this plant represents the *A. speciosa* var. α *nitida* of Michaux's Flora (I. 256), under which Wilmington is cited as one of the two localities where Michaux observed the plant. The description of the corolla as cylindric indicates that the flowers of Michaux's specimen had not yet fully opened, and in bud the shape of the corolla is cylindric becoming campanulate when open. Fortunately the question whether the name should be accepted or rejected is of little importance as there exists the older name *A. pulverulenta* Bartram (Travels, II. pl. opp. p. 476 [1791]), now generally referred to Zenobia as *Z. pulverulenta* Pollard. If, however, the name *A. pulverulenta* Bartram is rejected as a nomen seminudum, *A. wilmingtonia* will be the next oldest name, or if the green form and the glaucous form are considered distinct species *A. wilmingtonia* will be the oldest name for the green form.

26. *Andromeda axillaris* is the *A. axillaris* Lamarck of Michaux's Flora (I. 253), now *Leucothoe axillaris* D. Don.

27. *Andromeda nitida* is *A. nitida* Bartram of Michaux's Flora (I. 252), for which the oldest name is *A. lucida* Lamarck, now *Pieris lucida* Rehder (Mitteil. Deutsch. Dendr. Ges. XXIV. 226 [1915]), where complete synonymy is given.

28. *Andromeda ferruginea* is *A. ferruginea* Walter of Michaux's Flora (I. 252) which is now *Lyonia ferruginea* Nuttall.

29. *Andromeda formosissima* is *A. laurina* of Michaux's Flora (I. 253) for which the oldest name is *A. acuminata* Aiton, now *Leucothoe acuminata* D. Don.

30. *Robinia viscosa* is *R. viscosa* of Michaux's Flora (II. 65). This is the first mention of the name *R. viscosa* but as it is not accompanied by a description, Ventenat remains the author of the name, as his publication of the name is earlier than Michaux's description in his Flora (II. 65).

31. *Nyssa montana* is apparently the *N. villosa* of Michaux's Flora (II. 258) under which *N. montana* Hort. is mentioned as a synonym and

belongs to *N. sylvatica* Marshall. It is no doubt identical with *N. montana* hort. ex Pursh cited in Index Kewensis, but not with *N. montana* Gaertner which is referred to *N. ogeche*.

32. *Nyssa aquatica* is apparently the *Nyssa biflora* Walter of Michaux's Flora (II. 259).

33. *Nyssa dentata* is probably referable to *N. aquatica* L. which has more often dentate leaves than any of the other species. The name does not appear in Index Kewensis.

34. *Nyssa tomentosa* is apparently not the *N. tomentosa* of Michaux's Flora which is *N. aquatica* Marshall, but the *N. candicans* of Michaux's Flora (II. 259) which is the same as *N. tomentosa* Poiret and the *N. ogeche* Marshall. In both places, under *N. tomentosa* in the Journal and under *N. candicans* in the Flora the word "Ogechee" appears and in the description the words "foliis . . . incanis" in one place and "foliis . . . subcandicanticantibus" in the other indicate the identity.

THE RED RIVER FOREST AT FULTON, ARKANSAS

ERNEST J. PALMER

IN the course of botanical explorations conducted by the Arnold Arboretum in the southern and southwestern states several localities have been found so remarkable for the richness and variety of their ligneous flora as to appear worthy of brief description. These silvan centers or natural arboretums, as they may almost be termed, usually occur, as might be expected, in places where a considerable diversity of soil, moisture, drainage, light and other ecological conditions prevail within narrow limits. In addition to affording unusual opportunities for the observation and collection of a variety of trees and shrubs, some of them comparatively rare or growing beyond the limits of their generally recognized range, such localities are of especial interest as compact fields for the study of natural forest conditions in their various phases and for the evidence they furnish or suggest regarding certain changes that have occurred or are in progress in the composition and distribution of the plants of our forest flora.

About great trees and ancient forests there is something sublime and inspiring that appeals to all fine natures. In the silence and shadows of the great woods one instinctively feels a sense of tranquillity and seclusion from the busy world. There is a suggestion too of permanence and stability and quiet dignity. These values for us are real, but if we probe a little deeper we soon discover that the apparent inactivity is illusionary and but the result of a slower change than in the world of animate life. For here too is unceasing struggle and progress. Could we read the history of the forest in all its details it might be almost as replete with dramatic interest as any account of human events. There would be records of the rise and fall of dynasties, of long campaigns, conquests,

great migrations and sudden catastrophes. It would contain episodes of bold adventure and sudden turns of fortune, and accounts would not be lacking of ancient feuds, of friendships and firm alliances. The annals of these strange events are written in an obscure and varied language, but for the characters of which science is finding a key and enabling us to piece together portions here and there. Its early fragmentary records, impressed upon clay or inscribed upon stone lie deep buried in hills and plains. But in the living forests also the runic lines are scattered about and may often be read in characters of leaf and bud and flower, in atavisms and reversions toward ancient types, in strange associations and chains from which many links are missing. Here we come across small colonies isolated in some retreat far removed from their kind and kindred, and there we find in our northern forest a single representative of a tropical family or a species that appears to have survived from an earlier period. These larger questions and the romance of science they involve are, to be sure, somewhat beyond the scope of the present paper, which proposes only to describe briefly the ligneous flora of a small area particularly rich in species of the southern forest belt. Such localities, however, are replete with suggestions and evidence regarding the history and evolution of our floras. Nor could we hope to find even in the rich luxuriance of the tropical jungles nor amid the weird forms of the antipodal desert more interesting fields for investigating such questions than in our familiar American forests.

In that magnificent forest that but a century or so ago covered nearly all of eastern North America from the valley of the St. Lawrence and the Lakes to the Gulf of Mexico beyond the Mississippi, civilization and settlement have made great changes. Vast areas have been cleared and brought under agriculture. Axe and saw and fire-brand employed unceasingly have laid low magnificent stands of conifers and hard wood species; swamps have been drained and mountain sides denuded and cities and towns now flourish where was lately the heart of the wilderness. Beneficent as this progress in the main doubtless is, even though, as we are often reminded, it was prosecuted in many cases with little regard to present economy or future need, yet one cannot help reflecting with regret upon the tremendous interest and value that would have attended a comprehensive survey of the whole region under modern scientific methods, had such a thing been possible, while it was still practically intact. Even now, although we are beginning to take stock of what remains and to talk of conservation and reforestation, in many of the more recently settled parts of the country the work of destruction goes on unchecked. In travelling through portions of the South and Southwest one still commonly sees crops of cotton and corn planted in "deadenings," where the smaller plants have been cleared away and thousands of splendid specimens of Oaks, Hickories, Elms, Gums and other trees have been "girdled" and left to slow decay. One still sees in such sections each spring huge piles of logs and brush brought together to be burned and got rid of as so much

incumbrance to the land. In the lumbering districts it is not uncommon to see merchantable timber being felled and removed at the lowest possible present cost without regard to conserving the younger growth, which indeed is often later wantonly destroyed by fire, leaving large tracts as barren wastes incapable of reforesting themselves and quite worthless for agricultural or even for grazing purposes. In other sections the work of drainage and levee building is restricting more and more the swamp lands where formerly the Bald Cypress and other species flourished. Even where detached areas of the forest remain, almost everywhere within the region we are considering, many of the finer and more valuable trees have been culled out, and often in the vicinity of cities or centers of industry certain species are nearing extinction and others of foreign introduction are becoming mixed with the native growth. In spite of all these inroads, however, we of the present generation may still congratulate ourselves on the fact that in many remote places considerable remnants of the forest do remain, where it is possible to observe many phases of it practically under primitive conditions. It is perhaps needless to point out that the botanists of the future will not be so fortunate; for even though present destructive tendencies should be checked and the reverse prevail, the things restored will not be as they were in the beginning, and planting or even scientific forest management, desirable as they may be, must destroy to some extent the natural, primitive conditions so important to the scientific investigator.

Among localities in the southern portion of the great forest belt of eastern North America, which have been somewhat thoroughly explored by representatives of the Arnold Arboretum within the last few years, the following may be mentioned as examples in various ways possessing exceptional interest for the dendrologist. The vicinity of Selma, Dallas County, Alabama; the valley of White River and its tributaries in the Ozark region of southern Missouri and northern Arkansas; a section of the Kiamichi Mountains near Page, Le Flore County, Oklahoma; the canyons of the Guadalupe, Sabinal, Frio, Nueces and other streams in the Edwards plateau of southwestern Texas; the vicinity of San Augustine, in eastern Texas, and that of Fulton, on Red River, in southwestern Arkansas.

Considerable work has been done by agents of the Arboretum in each of these localities, the results of which is represented by large collections preserved in the herbarium; many interesting trees and shrubs brought into cultivation here for the first time and descriptions of a number of species and varieties new to science that have appeared in its publications from time to time.

Selma, Alabama, which has furnished one of the largest lists of woody plants of any locality in the United States, has not been visited by the writer. Professor R. S. Cocks, of Tulane University, and Mr. T. G. Harbison, however, have made large collections there and Professor Sargent has also visited it. A brief account of some of the peculiar plants

of the Edwards plateau was published in a former issue of this Journal (I. 233–239), although the list was an incomplete one; in another number (II. 216–232) mention was made of the interesting plants of the White River valley, and in the present paper it is proposed to give some account of the rich ligneous flora in the vicinity of Fulton, Arkansas.

The village of Fulton is situated on the west bank of Red River a short distance below the mouth of Little River. It is a station on the Missouri Pacific railway about 28 kilometers (18 miles) from the thriving town of Texarkana. In the steamboat days and before the coming of the railroads it was a trading and shipping point of some importance on account of the extensive cotton plantations in the fertile valley. During the civil war it was fortified by the Confederates in an attempt to hold the river against the advance of the Union gun boats. The trenches and gun pits on the hills above the town are still plainly visible. The present population is about five or six hundred, a large percent of which is colored. The village is protected by a levee, as otherwise it would be completely inundated by the river when it reaches flood stage, which usually occurs once or more a year. The river here forms the boundary between Hempstead and Miller Counties. It is spanned by a large railway bridge but for other crossing only a ferry is available. In the life of the community the big muddy stream is a dominating factor. To it is due the fertility of the valley and the big crops of cotton, and prosperity when seasons are favorable. But the flood demon in his angry moods is a constant menace to both planters and townfolks, assailing and often carrying off large sections of the low silt river banks and not infrequently devastating the whole wide valley with the tremendous volume of water that come down from the spring freshets in Texas and Oklahoma; and if in the immediate vicinity of the town he has been baffled of his prey by the defensive works of man he takes mean revenge in such small annoyances as mosquitos and malaria.

Opposite the town, on the Miller County side, is an extensive bottom, in places four to six kilometers wide. Much of the land has been brought under agriculture and portions of it are protected by double courses of levees, but there are still extensive tracts of semi-swamp lands covered with characteristic forest. The higher portions are occupied by open woods containing comparatively few species, amongst which *Populus balsamifera* var. *virginiana* Sarg., *Carya pecan* Engl. & Graebn., *C. cordiformis* K. Koch, *C. ovata* K. Koch, *C. myristicaeformis* Nutt., *C. Buckleyi* var. *arkansana* Sarg., *Quercus alba*, L., *Q. macrocarpa* Michx., *Q. rubra* L., *Q. Shumardii* Buckley, *Ulmus american* L., *U. crassifolia* Nutt., *U. alata* Michx., *Celtis laevigata* Willd., *Liquidambar Styraciflua* L., *Nyssa sylvatica* Marsh., *Acer Negundo* var. *texana* Sarg., *Fraxinus americana* L. and *F. pennsylvanica* var. *lanceolata* Sarg. are most abundant. Some fine specimens of *Quercus Durandii* Buckl. are occasionally found, usually occupying slight elevations, and amongst smaller trees, growing where the dominant species are less crowded or are an underworth in strict sub-

jection to them, may be mentioned *Carpinus caroliniana* Walt., *Ostrya virginiana* K. Koch., *Cornus asperifolia* Michx., *Diospyros virginiana* L., *Bumelia lanuginosa* Pers., *Prunus mexicana* Wats., *Crataegus viridis* L., *C. spathulata* Michx. and *Cercis canadensis* L. There is generally here but slight development of shrubs or herbaceous plants. *Ilex decidua* Walt., *Benzoin aestivale* Nees, *Forestiera acuminata* Poir. and *Callicarpa americana* L. are abundant in places, and sometimes about the roots of a large tree on a low mound smaller shrubs, such as *Arundinaria macrosperma* Michx. and species of Rubus and Vaccinium find foothold. Commonest of all, however, is the Palmetto, *Sabal minor* Pers., which often covers large areas where the tree growth is not too dense. Woody vines also play a very subordinate rôle. The commonest ones noted here are the Grapes, *Vitis cinerea* Engelm. and *V. cordifolia* Michx., the Virginia Creeper, *Parthenocissus quinquefolia* var. *hirsuta* Planch., *Rhus Toxicodendron* L., *Berchemia scandens* Trel. and *Brunnichia cirrhosa* Banks.

In these low woods the trees generally develop slender straight trunks and the stand is often heavy. Many of them attain a large size, and while much culling has now been done, especially among the species most valuable for lumber, some magnificent specimens of Cottonwood, Oaks, Elms, Hickories and Gums may yet be found.

Numerous bayous and small lakes, often vestiges of former river channels, are encountered, and along their margins and in shallower depressions real swamp conditions prevail. Along the banks of the river and smaller bodies of water the tall stems of the Black Willow, (*Salix nigra* var. *altissima* Sarg.) is very common. Specimens 30 meters tall and more than a meter in diameter are not rare. This tree grows here with a straight clear trunk and has thick, very deeply fissured bark. Characteristic of the real swamp areas and depressions where water remains for a considerable part of the year are The Bald Cypress (*Taxodium distichum* Rich.), Swamp hickory (*Carya aquatica* Nutt.), Water Oak (*Quercus nigra* L.), Overcup Oak (*Q. lyrata* Walt.), Water Elm (*Planera aquatica* Gmel.) and Swamp Honey Locust (*Gleditsia aquatica* Marsh.). Common also to this habitat are *Carpinus caroliniana* Walt., *Liquidambar Styraciflua* L., *Crataegus viridis* L., *Acer rubrum* L. and *Fraxinus pennsylvanica* var. *lanceolata* Sarg. Amongst smaller growth is the Palmetto, Small Cane (*Arundinaria macrosperma* Michx.), *Itea virginica* L., *Forestiera acuminata* Poir. and *Cephalanthus occidentalis* L., the last two species often forming extensive thickets. Rank growths of sedges, grasses, rushes, ferns and other aquatic herbaceous plants often accompany these. The margins of some of these swampy lakes are almost tropical in appearance, with various species of lofty trees interspersed with a tangle of shrubs and vines coming down to the water's edge, among them Bald Cypress with straight columnar trunk rising from a buttressed base, sometimes four or five meters in diameter and well out in the water, surrounded by a grotesque assemblage of the aerial root cones, commonly known as "knees," and little mounds

of islands formed about great rotting stumps and linked together by a criss-cross of moss-grown logs, upon all of which small shrubs, tufts of grass and a variety of other plants are growing, while the surface of the stagnant water is covered with a thick scum of green algae, Riccias, Lemnas and sometimes *Azolla caroliniana*. This miasmic tranquillity is occasionally disturbed by a turtle gliding off a log or a moccasin or cottonmouth uncoiling and sliding lazily into the slime. Some of these bayous abound in fish, and alligators were formerly and I believe are still occasionally found in them. Some giant alligator-gars have been taken in Red River at Fulton. Besides some aquatic birds and frogs little other animal life is now to be seen about the swamps.

Before leaving the low woods it should be explained that the whole area we have been describing is subject to inundation whenever the river is at flood stage, and usually for weeks or even months during the spring and early summer water stands from one to six or more decimeters over the higher flat portions often leaving its uniform mark upon the tree trunks after it has receded. Later in the season most of the land becomes quite dry while the water is restricted to the lakes and bayous.

On the opposite side of the river, in Hempstead County, an escarpment rises with a maximum height of about six or eight meters above the first terrace approaching to within about half a kilometer of the stream just north of Fulton. This escarpment, obviously representing an old bank of the river, is capped with clay and gravel of the Pliocene period (Lafayette). The pebbles and boulders of silicious rock are thoroughly rounded and water worn, and were evidently originally derived from the Paleozoic deposits of the Ouichita Mountains to the northward. Beneath the Tertiary clay and gravel are beds of soft marly fossiliferous sandstones alternating with clays, which outcrop along the margins of the elevation and in deep ravines somewhat farther north, as will be mentioned later. The uplands, of which the escarpment at Fulton forms the southern boundary, extend westward to the valley of Little River and northward toward the Little Missouri. The surface is generally flat and where the clay and gravel deposit is present the soil is of low fertility and the drainage poor. After the heavy spring and autumn rains water stands for some time in every slight depression, and after it has disappeared the ground becomes hard and baked. Here is developed the typical "flat woods," composed of a mixed growth of Pine and deciduous trees. Two species of Pine are present, *Pinus taeda* L. and *P. echinata* Mill. The former is much more abundant than the latter, in places forming a large percentage of the forest and even developing pure stands over small areas. Amongst broad-leaved trees Hickories and Oaks are most abundant, both in individuals and number of species. Characteristic deciduous species here are *Carya alba* K. Koch, *C. Buckleyi* var. *arkansana* Sarg., *C. ovalis* var. *obcordata* Sarg., *C. myristicaeformis* Nutt., *Quercus alba* L., *Q. stellata* Wang., *Q. phellos* L., *Q. rubra* L., *Q. Shumardii* Buckl., *Ulmus alata* Michx., *Liqui-*

dambar Styraciflua L., *Prunus mexicana* Wats., *Crataegus spathulata* Michx., *C. apiifolia* Michx., *Nyssa sylvatica* Marsh. and *Fraxinus americana* L. In the uplands as in the low woods the slight development of the lower layer of shrubs and herbaceous plants is noticeable. Small patches or single individuals of such minor trees and shrubs as Prunus and Crataegus, *Ilex decidua* Walt., *Vaccinium arboreum* Marsh., *Rubus Andrewsianus* Blanch., *Rhus copallina* L. and *Rosa setigera* Michx. are sometimes found along the borders or in the more open portions. Grasses and herbaceous flowering plants are generally almost entirely absent. In a few larger openings, on the banks of streams and along the escarpment many other species appear and something like thickets with a tangle of shrubs and vines is developed. In such places grow several additional species of Crataegus of the *Crus-galli*, *Viridis* and *Punctatae* groups, *Malus ioensis* var. *Palmeri* Rehd., *Zanthoxylum Clava-Herculis* L., *Cercis canadensis* L., *Diospyros virginiana* L., *Bumelia lanuginosa* Pers., *Smilax bona-nox* L., *Berchemia scandens* Trel. and *Ampelopsis arborea* Koehne. Many kinds of non-woody flowering plants also manage to thrive here. Where the clay and gravel are much eroded, as is sometimes the case on steepish hillsides, a somewhat more xerophytic phase of the flora is developed. *Juniperus virginiana* L., *Maclura pomifera* Schneid., *Berchemia scandens* Trel. and *Cocculus carolinus* DC. seem at home here, and some of the herbaceous species are even more characteristic, such as *Ophioglossum Engelmanni* Prantl, *Agave virginica* L. and *Opuntia humifusa* Raf.

Where the Lafayette gravel and clay is absent and the Cretaceous formations appear on the surface, conditions are very different. The soil is of a loose sandy loam, often quite fertile on account of the shell-marl and humus which it contains. The surface is easily eroded and often deep gullies and canyons are found working back into the plateau. Perennial springs issue in some of these hollows, and their banks are clothed with many species of ferns, flowers and shrubs. Sometimes remnants of the gravel and clay cap the domes or ridges between the ravines, and there is a descending scale of sterile gravelly flat, sandy slopes, deep protected banks and lower down perhaps a sandy bog bordering a stream or bayou. It is in such situations that the peculiarly rich flora has developed and many of the rare plants are found. A short distance southwest of the railway station at the village of McNab, near the junction of Yellow Creek and Little River, these conditions are typically developed. A deep cut in the railway grade gives an excellent exposure of part of the geologic section. Layers of soft sandstone from one to two meters thick, carrying many large calcareous oyster shells and other fossils, were seen with five or six meters of fine unconsolidated sand above and a similar deposit beneath. Near the point where the railroad crosses Little River the valley is bounded by a bluff, the highest and most precipitous to be found in the vicinity. At the highest point it rises perhaps 18 to 20 meters above the valley, and as it has a northern exposure and a slope of from 60 to 75

degrees it is a most favorable situation for the growth of many plants. Near the top of this bluff and along the gravelly ridge above is found one of the rarest of American Oaks, *Quercus arkansana* Sarg. This is near the type locality where it was first discovered by Mr. B. F. Bush in 1909. It is a small tree, seldom exceeding 10 meters in height with a trunk diameter of 50 centimeters. It has rough dark furrowed bark resembling that of the Black Oak. The foliage is somewhat similar to that of *Quercus marilandica* but the leaves are much smaller, thinner and of a distinct pattern. Its small fruit suggests affinities with *Quercus nigra*, but it certainly is not a hybrid between them, and is indeed a very distinct species. Within a radius of six or seven kilometers of the village of McNab I have examined carefully scores of specimens of this curious Oak, and doubtless many hundreds could be found, but it appears to be strictly limited to the sand hills and small streams traversing them in the Fulton region. Since becoming acquainted with it several years ago I have made diligent seatch for it in other localities in Arkansas and surrounding states where conditions appeared favorable, but so far it has proven entirely fruitless. An interesting sequel is, however, that it has apparently been found near Troy, Pike County, Alabama, where it was collected as long ago as 1880 by Dr. Chas. Mohr, and in 1912 and 1913 by Dr. Roland M. Harper. Dr. Harper's specimens in the Arnold Arboretum Herbarium represent both the young leaves and flowers and the mature leaves with a single fruiting cup. On Dr. Mohr's specimen, taken on July 4th, the leaves are mature and fruit about half grown. In these specimens the leaves are rather thinner and more nearly glabrous than in most of those from the Fulton region, but some of the specimens from McNab closely match them in these respects. In leaf type, scales of the fruit cup, winter buds and other characters there is close resemblance. Indeed there is fully as great a range of variability in all these respects between different specimens taken near the type locality as between the type specimens and those from the Alabama trees. Since the two localities are so far removed from each other and, so far as present knowledge goes, *Quercus arkansana* is comparatively rare and quite local at both places, the circumstance is very interesting and its significance will be referred to later in this article.

Other Oaks growing along the upper portion of the bluff at McNab and on the ridge above it are *Quercus marilandica* Muench., *Q. alba* L., *Q. Muhlenbergii* Engelm., *Q. Durandii* Buckl. and *Q. stellata* Wang. and a hybrid between the last two species, represented by a single tree, also occurs. It is a tree 8 or 9 meters in height, with pale, slightly flaky bark, more nearly resembling that of *Q. Durandii*. The variable leaves and the fruit are quite intermediate between the two supposed parents, both of which are growing in close proximity to the hybrid. Lower down on the bluff are some fine specimens of *Quercus Shumardii* Buckl., and *Q. phellos* L., *Q. nigra* L. and *Q. lyrata* Walt. are all growing in low ground just below its base. On the dryer portions of the bluff are

also found *Juniperus virginiana* L., *Pinus taeda* L., *Ulmus alata* Michx., *Celtis laevigata* var. *texana* Sarg., *Morus rubra* L., *Ostrya virginiana* K. Koch, *Diospyros virginiana* L., *Bumelia lanuginosa* Pers., *Fraxinus americana* L., *Rhamnus caroliniana* Walt. and *Viburnum rufidulum* Raf. Growing usually lower down on the protected slopes are *Arundinaria tecta* Michx., *Sassafras officinale* Nees & Eberm., *Carpinus caroliniana* Walt., *Liquidambar Styraciflua* L., *Nyssa sylvatica* Marsh., *Cornus racemosa* Raf., *Ilex decidua* Walt., *I. caroliniana* Trel., *Hamamelis macrophylla* Pursh, *Cercis canadensis* L., *Robinia Pseudoacacia* L., *Tilia floridana* Small, *Acer saccharum* var. *glaucum* Sarg. and *Fraxinus quadrangulata* Michx. Of the speceis enumerated above *Ilex caroliniana* is apparently rare and local, not having been noted elsewhere in the vicinity, although it might probably be found in similar situations. *Hamamelis macrophylla* is also comparatively rare here, but is found more abundantly along small sandy creeks in the vicinity. *Robinia Pseudoacacia* is rather abundant and is certainly native here, although beyond the range usually assigned to it. Of *Fraxinus quadrangulata* there are a number of medium sized trees growing well down towards the base of the bluff. So far as I know this station is the farthest southwest at which it has been found.

A large number of herbaceous plants, some of them apparently quite local, are growing along the bluff, and there is the same curious mingling of northern and southern forms amongst them as in the ligneous species. On the dry ridges and in the deep ravines in the immediate vicinity of this bluff are the type localities of *Prunus mexicana* var. *fultonensis* Sarg., a quite distinct variety of the "Big Tree" Plum; of *Aesculus Bushii* Schneider, a hybrid between *Ae. glabra* var. *leucodermis* Sarg. and *Ae. discolor* var. *mollis* Sarg.; of *Crataegus brachyphylla* Sarg., *C. lacera* Sarg. and of *C. notha* Sarg., the last a hybrid between *C. apiifolia* Marsh. and *C. brachyphylla*. Another interesting tree found in this vicinity is *Sophora affinis* T. & G., a southern species most abundant on the limestone hills of central and western Texas. Here it grows on the top and slopes of the gravelly ridges, where it attains a medium size for the species and flowers and fruits freely.

Descending into the moist sandy ravines we find, especially on the north sides, the banks clothed with ferns and herbaceous flowering plants and such shade loving woody species as *Evonymus americanus* L. and *Vaccinium virgatum* Ait. In such situations is often found the delicate little Partridge Berry (*Mitchella repens* L.) and sometimes such Orchids as *Hexalectris, Spiranthes* and *Corallorrhiza*.

The springs that issue from some of the deeper of these canyons and the quantities of fine sand and humus eroded through their action and that of the intermittent floods spread out over the low grounds in the valleys and form bogs. These sometimes have quite a characteristic flora. Typical of such situations and their environs are *Myrica cerifera* L., *Itea virginica* L., *Amorpha paniculata* T. & G., *Alnus rugosa* K. Koch,

Lyonia ligustrina DC., *Vaccinium corymbosum* L., *Rhododendron oblongifolium* Millais, and *Styrax americana* Lam. The Small Cane (*Arundinaria macrosperma* Michx.) and the Palmetto (*Sabal minor* Pers.) are also found here. Amongst woody climbers are *Wisteria macrostachya* Nutt., *Smilax laurifolia* L., *S. lanceolata* L. and *Vitis palmata* Vahl. A number of trees are found but they are scarcely so characteristic as the shrubs, since most of them occur also in the low swampy woods of the river bottoms. *Taxodium distichum* Rich., *Planera aquatica* J. F. Gmel., *Carpinus caroliniana* Walt., *Betula nigra* Marsh., *Salix nigra* Marsh., *Liquidambar Styraciflua* L., *Acer rubrum* var. *Drummondii* Sarg. and *Fraxinus pennsylvanica* var. *lanceolata* Sarg. are amongst the commonest species. Rank growths of the Cinnamon and Flowering Ferns, *Woodwardia areolata* Moore, *Asplenium Filix-femina* Bernh. and several others, besides Orchids, Sundews and other rare and interesting small plants flourish in such situations. These spring-fed bogs in turn are the sources of or tributary to small creeks, the shady but well-drained bottom lands of which support a varied forest flora. In addition to many of the species mentioned previously as occurring in the bogs and low woods, several appear to be most at home in such locations. Amongst these are *Aralia spinosa* L., *Benzoin aestivale* Nees, *Symplocos tinctoria* L'Her., *Acer floridanum* Pax, *Tilia caroliniana* Mill., *T. caroliniana* var. *rhoophila* Sarg., *Ilex opaca* Ait., and *Vitis rotundifolia* Michx.

As the soil of these little valleys is of high fertility, at least for a few seasons after it has been cleared for agriculture, but few examples of this composition of the forest remain. Indeed throughout the whole region about Fulton the work of clearing and destroying the forest is going on with great rapidity, and in the portions that remain most of the finest specimens of trees valuable for lumber have been culled out. Within the last few years many of the small swamps and bogs have been drained and through the construction of levees and ditches a great deal of bottom land has been added to the cultivated area. From one to three saw logs are usually obtained from the largest trees of Pine, Cypress or Oak, and the remainder is left to decay where felled. When the land is to be brought into cultivation the general practice is to clear out the smaller growth and dispose of this and the dead tree tops by fire, to then deaden the remaining large trees and leave them to slow decay while crops are laboriously cultivated amongst them. Even more distressing to the forest lover and the botanist is the sight of the wholesale destruction of Ash and Hickory on the uplands in search for handle material, the trees often yielding only one or two short cuts suitable for this purpose, or to see such interesting trees as *Quercus Durandii* or *Q. arkansana* felled to obtain a single railroad tie. Much of the uplands that are now being cleared are also of very slight value for agricultural purposes, some of them being too sterile and ill drained and others in the sand hill section being subject to rapid destructive erosion as soon as the protecting forest cover has been removed.

Of the following list of woody plants nearly all have been noted or collected by the writer in the Fulton region. In a few cases species have been included on the evidence of herbarium specimens preserved at the Arnold Arboretum, chiefly collected by Mr. B. F. Bush, who visited the locality several times and made extensive collections there. Some omissions doubtless occur, as no attempt was made while in the field to compile a list for the entire region.

PINACEAE

Pinus taeda L. Often common in flat upland woods, but usually growing in mixed stands with Hickories, Oaks and other broad-leaved trees.

Pinus echinata Mill. Growing in similar situations as the last species but less common.

Juniperus virginiana L. Nowhere very abundant but most frequent on clay slopes and barrens along the escarpment; sometimes also found in low woods and on banks of ravines in the sand hills.

Taxodium distichum (L.) Rich. One of the largest and most striking trees, growing in swamps and along the margins of lakes and bayous.

GRAMINAE

Arundinaria macrosperma Michx. A common shrub of the lowlands and along the margins of sandy bogs. Extensive cane-breaks, however, are not developed in this section and the canes seldom exceed two or three meters in height and three or four centimeters in diameter.

PALMAE

Sabal minor (Jacq.) Pers. Often common and growing in large patches in the low swampy woods and also sometimes found in bogs in the sand hills section.

LILIACEAE

Smilax rotundifolia L. Low woods and thickets; often abundant.

Smilax glauca Walt. Common in low swampy woods and sandy bogs.

Smilax bona-nox L. Abundant in dry thickets and clay barrens; also growing in low fields and along railroads.

Smilax lanceolata L. A tall growing species found in rich sandy woods and bogs.

Smilax laurifolia L. Growing in similar situations to the last and of like habit.

JUGLANDACEAE

Juglans nigra L. Sometimes growing to a good size in well drained upland woods, but nowhere very common.

Carya pecan Engl. & Graeb. Not uncommon on river banks and in low woods.

Carya cordiformis (Wang.) K. Koch. A rather abundant species in low woods where it grows to a large size, trees 30 to 35 meters in height and

one meter or more in diameter being sometimes met with. It is also found on bluffs and banks of small streams where it is usually much smaller.

Carya cordiformis var. *latifolia* Sarg. The broad leaved form of the Pignut is sometimes found on bluffs and in upland woods.

Carya myristicaeformis (Michx. f.) Nutt. This comparatively rare Hickory, with its curious nutmeg-like fruit, is perhaps more abundant in the Fulton region than anywhere else. It is found both in low woods and in the flat uplands. It has pale scaly bark and often becomes a fine tree up to 30 or 35 meters tall.

Carya aquatica (Michx. f.) Nutt. A large tree common in low swampy woods. The bark is usually very shaggy and the wood is said to be of inferior value to that of the other Hickories.

Carya ovalis var. *obcordata* Sarg. This form of the small fruited Hickory or Pignut, as it is often called in the north, is occasionally found on bluffs or in flat upland woods, and it probably reaches about its southwestern limit here.

Carya alba (L.) K. Koch. Common in flat upland woods and on gravelly ridges.

Carya ovata (Mill.) K. Koch. Found occasionally in flat upland woods, but not very common.

Carya Buckleyi var. *arkansana* Sarg. This is the commonest Hickory of the region, and it often forms a large percentage of the woods on flat uplands. It is also sometimes found in the low woods, on the sand hills and in almost all situations except in the permanent swamps. It becomes a medium sized tree up to 20 or 25 meters in height. The wood is valuable and is much sought, with that of other Hickories, for handles and wagon timber. The bark is rather thick and ridgy but not scaly. The fruit is edible but the kernel is closely compressed in a thick shell; it varies greatly in size and shape.

Carya Buckleyi var. *arkansana* f. *pachylemma* Sarg. The type tree of this form was found growing on a bench between the uplands and low bottoms a short distance from Fulton. Although the nut itself is not as large as in some forms of *C. laciniosa* the very thick involucre makes it perhaps the largest-fruited of the Hickories.

MYRICACEAE

Myrica cerifera L. Growing in low sandy woods and margins of bogs.

SALICACEAE

Salix nigra Marsh. Often very common in low woods and along streams.

Salix nigra var. *altissima* Sarg. Large specimens of the tall Black Willow are common on the banks of Red River and in the low woods.

Salix longifolia Muhl. Growing along bayous and banks of streams.

Populus balsamifera var. *virginiana* (Henry) Sarg. Some very large specimens of this Cottonwood are found on the banks of Red River, and it is also often common in low woods.

BETULACEAE

Carpinus caroliniana Walt. Frequent in low woods and along margins of swamps.

Ostrya virginiana (Mill.) K. Koch. A common small tree of upland woods.

Betula nigra Marsh. Frequent on banks of streams and margins of bogs and lakes.

Alnus rugosa (DuRoi) K. Koch. Common in sandy bogs and along small streams in the sandy area.

FAGACEAE

Castanea alnifolia Nutt. Occasionally found in sandy woods and along bluffs and hillsides in the sand hills section.

Quercus alba L. A common Oak, of which many fine specimens occur in upland woods.

Quercus alba var. *latiloba* Sarg. Trees with leaves having broad shallow lobes are sometimes found growing with the typical form. Extreme specimens look distinct but there is a complete gradation between them.

Quercus Durandii Buckley. This species is also popularly known as White Oak, and in bark and wood resembles *Quercus alba*, but in its small irregularly lobed glossy leaves and its extremely small fruit with cups reduced almost to disks, it is very distinct and striking. In eastern Texas, where it is widely distributed but nowhere very common, it grows usually in the better drained portions of low bottoms. Some very fine specimens are found in similar locations near Fulton, but it is even more common on gravelly ridges in the sand hills section. This is apparently the northern limit of its range west of the Mississippi.

Quercus stellata Wang. Rather common in upland woods throughout, but most abundant on dry gravelly ridges.

Quercus macrocarpa Michx. Not rare and growing to a large size in low woods.

Quercus lyrata Walt. A common species of low and swampy woods, growing in wetter situations than any other Oak except *Quercus nigra*.

Quercus Muhlenbergii Engelm. On bluffs and hillsides in the uplands, but nowhere common.

Quercus phellos L. The Willow Oak is one of the commonest species in low woods, and it is often also abundant in flat poorly drained uplands. Fine large specimens are frequent.

Quercus nigra L. A common species of the low bottoms.

Quercus marilandica Muench. Sometimes frequent in upland woods; most abundant on gravelly ridges and eroded hillsides.

Quercus arkansana Sarg. Confined to the sand hills sections where it is locally frequent on the banks of small streams and on slopes and ridges.

Quercus rubra L. This species, the Spanish Oak of the books and the *Quercus falcata* Michx., is commonly called Red Oak in the South. It is one of the commonest species in the Fulton region, being found both in

low woods and on the flat uplands. In the latter environment it often forms a large percentage of the forest. Some magnificent specimens occur, attaining a height of 35 meters or more, a trunk diameter of nearly 2 meters and with a wide spread of branches in more open situations.

Quercus Shumardii Buckley. Commonest in flat upland woods and on banks of streams. A fine handsome species, distinguishable from the variety *Schneckii* by the broad flat, often tubercled cups of its fruit, which in size and shape resembles that of the northern Red Oak. There is often also a marked difference in the leaves of the upper and lower branches, the former being deeply incised and the latter having shallow open sinuses.

Quercus Shumardii var. *Schneckii* (Brit.) Sarg. Often frequent in upland woods; prefering banks and well drained soils. This is a handsome Oak, sometimes attaining a height of more than forty meters and a trunk diameter of more than a meter. The trunk, usually rising from a well buttressed base, is typically straight and free from branches for a considerable height.

Quercus velutina Lam. This species is rather common in places in upland woods.

Quercus velutina var. *missouriensis* Sarg. Common with the last.

× *Quercus subfalcata* Trel. Several individuals of this interesting hybrid between *Quercus phellos* and *Q. rubra* have been found in the flat upland woods in the vicinity of Fulton and McNab.

Quercus nigra × *Shumardii*. A supposed hybrid between these two species has been found on the banks of a small creek a few miles from McNab. The tree is of adult size, perhaps 10 meters in height, but fruit has not yet been collected from it. It is growing in close proximity to the supposed parents.

Quercus Durandii × *stellata*. A single individual, apparently a hybrid between these two species, is growing on the top of a bluff near McNab, as described in a former paragraph of this article.

ULMACEAE

Ulmus americana L. An abundant species in upland woods.

Ulmus alata Michx. Commoner than the last and more widely distributed; often growing in low flat woods as well as on uplands.

Ulmus crassifolia Nutt. The commonest Elm of low swampy woods, but also found on flat poorly drained lands of the Lafayette formation.

Ulmus fulva Michx. Rather uncommon and confined to banks and bluffs of the sand hills section.

Ulmus serotina Sarg. This rather rare, or at least little known, southern Elm has recently been found in low sandy woods near McNab.

Celtis laevigata Willd. Common and growing to a large size in low swampy woods, and also found less abundantly on flat uplands.

Celtis laevigata var. *texana* Sarg. This well marked variety is sometimes found in upland woods and along the banks of small streams.

Planera aquatica (Walt.) J. F. Gmel. A typical species of the swamps, often growing along the margins of lakes and bayous.

MORACEAE

Morus rubra L. Not rare in upland woods, especially along the escarpment, and sometimes also found in the lowlands.

Maclura pomifera (Raf.) Schneid. Found on dry gravelly ridges and eroded hillsides and occasionally in openings along small streams.

LORANTHACEAE

Phorodendron flavescens (Pursh) Nutt. The Mistletoe is often common in the lowlands and on the flat uplands. It is found most frequently growing as a parasite on the Elms, but has also been noted on several of the Red Oaks, on *Nyssa sylvatica*, *Gleditsia triacanthos* and *Platanus occidentalis*.

ARISTOLOCHIACEAE

Aristolochia tomentosa Sims. Growing in low sandy ground along a small creek near McNab.

POLYGONACEAE

Brunnichia cirrhosa Banks. A common woody vine of the low woods, where it attains a large size, climbing to the tops of the largest trees and forming stems sometimes 6 to 8 centimeters in diameter.

ANONACEAE

Asimina triloba (L.) Dunal. Growing as a shrub or small tree in rich woods, especially along small creeks in the sand hills section.

RANUNCULACEAE

Clematis crispa L. This small species is sometimes found in low ground, in thickets and on open banks.

Clematis Simsii Sweet. Sometimes found in thickets and open ground in the sand hills section.

Clematis reticulata Walt. Apparently rare, this species has been collected along sandy bogs near Columbus.

MENISPERMACEAE

Cocculus carolinus (L.) DC. Sometimes common in thickets and barrens and on open banks.

LAURACEAE

Sassafras officinale Nees. & Eberm. A small tree of upland woods and thickets.

Benzoin aestivale (L.) Nees. Rich woods and margins of bogs in the sand hills section; occasionally also found in low woods in the river valley.

SAXIFRAGACEAE

Itea virginica L. Confined to bogs and swamps where it sometimes takes root on decaying stumps and logs.

HAMAMELIDACEAE

Hamamelis macrophylla Pursh. Growing along the banks of small sandy streams where it becomes a small tree or more frequently a tall shrub five or six meters in height.

Liquidambar Styraciflua L. One of the largest and commonest of forest trees in the region, sometimes attaining a height of from 30 to 40 meters. It appears to be very adaptable, growing in all sorts of soils and environments from the dry ridges to permanent swamps. In the lowlands and flat upland woods it is often an important constituent of the forest.

PLATANACEAE

Platanus occidentalis L. Growing sometimes to a large size on the banks of rivers and smaller streams, but nowhere very common.

ROSACEAE

Malus ioensis var. *Palmeri* Rehd. A spiny shrub or small tree in thickets and openings along the margins of the uplands.

Rubus Andrewsianus Blanchard. Common in openings of low woods, in upland thickets and along the margins of swamps and bogs.

Rubus trivialis Michx. Thickets and open woods.

Rubus rubrisetus Rydb. Common in low open woods, especially on banks and margins of swamps and bayous.

Rosa setigera Michx. The smooth form of the Prairie Rose is found in thickets and open woods, in rather dry situations.

Rosa setigera var. *tomentosa* T. & G. This form, differing in the pubescence of the leaves and young branches, is sometimes found in similar situations to the last.

Rosa carolina L. This low growing Rose is often found in open sandy woods and in upland thickets. It is the species that long passed under the name of *Rosa humilis* Marsh.

Rosa texarkana Rydb. I have not recognized this species in the Fulton area but as the type was collected by Eggert at Texarkana, only a few kilometers beyond our limits, it is doubtless to be looked for here.

Crataegus apiifolia Michx. A very common species growing in thickets and open woods both in the lowlands and in the dryest situations.

Crataegus spathulata Michx. About as abundant as the last named species and growing in similar situations.

Crataegus trianthophora Sarg. A low shrubby form of wide distribution that has been found in open sandy woods.

Crataegus bellica Sarg. The type of this species was collected near Fulton, where it is common in thickets along the escarpment and in openings of upland woods. It has since been recognized at other stations in eastern Arkansas, Texas, Oklahoma and southern Missouri. It is a shrub with remarkably spiny, intricate, zig-zag branches.

Crataegus Bushii Sarg. A small tree, belonging like the last to the Crus-galli group. The type locality was Fulton. It is now known also from several stations in western Louisiana, eastern Texas and Oklahoma.

Crataegus palliata Sarg. This small tree also belongs to the Crus-galli group, and type was collected at Fulton. It grows in fertile open woods and on rich hillsides.

Crataegus triumphalis Sarg. A small tree of the Crus-galli group, growing in open upland woods. The type locality is Fulton.

Crategus sordida Sarg. This is a small tree of the Punctatae group originally described from southern Missouri. Two trees have been found near Fulton, growing in a thicket on the edge of the upland woods, which perhaps belong to this species.

Crataegus fastosa Sarg. A small tree of the Punctatae group growing in low woods. The type locality is Fulton.

Crataegus amicalis Sarg. A species originally described from Fulton, belonging to the *Viridis* group. It is a small tree growing in open upland woods.

Crataegus micrantha Sarg. A small slender tree of the Viridis group, growing in low woods near Fulton, from which locality it was originally described.

Crataegus blanda Sarg. A small round-topped tree of the Viridis group rather abundant in upland woods and on gravelly ridges in the Fulton region. It differs from most of the other species of this group in its rather thick dark bark. This species has also been found in Alabama, Louisiana and Texas.

Crataegus velutina Sarg. This species closely resembles *C. viridis* L. except in its more or less densely pubescent leaves, branchlets and inflorescence. It is rather common about Fulton which is the type locality and it has also been found in eastern Texas.

Crataegus enucleata Sarg. A small tree of upland woods. Type material of this species was collected at Fulton. It belongs to the Viridis group.

Crataegus lacera Sarg. A slender tree growing in rich soil in open situations. It is one of the most interesting species described from the Fulton region, being very distinct in characters and of dubious affinities. It was doubtfully referred to the Tenuifoliae group by Professor Sargent, but it differs markedly from other members of that section, which has no other representative known west of the Mississippi River. It may represent a distinct group of this large genus.

Crataegus viridis L. A very common species growing both in low woods and in the flat uplands. It is one of the largest of all the Haws, sometimes becoming a tree 10 meters or more in height.

Crataegus induta Sarg. This is a small tree of the Molles group growing in upland woods near Fulton, which is the type locality.

Crataegus invisa Sarg. This species, also belonging to the Molles group, is rather abundant in rich low woods throughout the Fulton region, where it was first found. It has also been collected at San Augustine, in eastern Texas.

Crayaegus limaria Sarg. A medium sized tree of the Molles group, of which Fulton is the type station. It is also found in Oklahoma and has a wide range in Texas, extending to the southwestern part of the state and also into Mexico.

Crataegus brachyphylla Sarg. This recently described species is one of the comparatively rare and local plants of the gravelly ridges and sand hills near McNab. It is a small tree, growing usually in thickets or open hillside woods, and is very distinct from most of the other species of the group.

× *Crataegus notha* Sarg. This interesting plant, supposed to de a hybrid between *C. apiifolia* and *C. brachyphylla*, is growing sparingly on gravel-capped ridges and sandy slopes near McNab. It is a small tree sometimes shrubby in habit, with thin flaky bark, resembling that of *C. apiifolia*. In leaves, flowers and fruit it is quite intermediate between the two supposed parent species, both of which are growing in close proximity to it.

Prunus serotina Ehrh. Not uncommon in upland woods, usually growing on hillsides or in well drained ground.

Prunus angustifolia var. *varians* Wight. Extensive thickets of this shrubby Plum are sometimes found on gravelly hillsides and semi-barrens along the escarpment. It usually grows to a height of from one to two meters and is a free bearer. The fruit is of fair quality and there is both a yellow and red form.

Prunus Munsoniana Wight & Hedrick. Sometimes found in thickets and open woods along the margins of the uplands.

Prunus mexicana Wats. This species is quite common in open upland woods and also sometimes grows in the bottoms. It becomes a large tree for the genus, some specimens measuring ten meters in height with a trunk diameter of three decimeters. It usually bears freely but the fruit is of inferior quality and badly infested with weavil.

Prunus mexicana var. *polyandra* Sarg. Occasionally found in fertile soil, growing in open woods.

Prunus mexicana var. *fultonensis* Sarg. This rather distinct variety is not uncommon in the sand hills section near McNab, from which locality the type specimens came.

Prunus umbellata Ell. A small tree sometimes found in the sand hills section.

Prunus umbellata var. *tarda* (Sarg.) Wight. Found in open woods and on slopes in the sand hills section.

LEGUMINOSAE

Cercis canadensis L. Frequent in open woods and thickets, especially on hillsides in the sandy section.

Gleditsia triacanthos L. Found throughout in upland woods and sometimes in the bottoms, but nowhere very common.

Gleditsia aquatica Marsh. A common and characteristic species of the

low swampy woods, perhaps being more abundant here than anywhere else in its range.

Robinia Pseudoacacia L. Found in thickets along the escarpment and on bluffs and ridges near McNab, where it is certainly native.

Sophora affinis T. & G. This interesting southern tree is growing sparingly along gravelly ridges above the sandstone in the hills near McNab. The trees flower and fruit freely and some of them attain nearly the maximum size for the species.

Amorpha fruticosa L. Growing in open situations in low woods and along the margins of swamps and bogs.

Amorpha paniculata T. & G. A species of eastern Texas that has been found growing in sandy bogs near McNab.

Wisteria macrostachya Nutt. A high climbing vine of sandy bogs and low sandy woods.

Acacia angustissima (Mill.) Ktze. This little shrub, of which the base only is usually woody, has been found in thickets and barrens.

RUTACEAE

Zanthoxylum Clava-Herculis L. Rather infrequent in thickets and open woods, on eroded hillsides along the escarpment and in the sand hills.

Ptelea trifoliata L. Thickets and open hillsides along the escarpment.

ANACARDIACEAE

Rhus Toxicodendron L. Common everywhere in woods and thickets.

Rhus quercifolia (Michx.) Steud. A low shrub, usually not more than half a meter tall, growing in sandy soil of the Cretaceous area.

Rhus glabra L. Occasionally found in thickets and open woods.

Rhus copallina L. On the bluff at McNab and sometimes found elsewhere in flat open woods.

AQUIFOLIACEAE

Ilex opaca Ait. Sandy woods and banks of small streams in the Cretaceous area.

Ilex decidua Walt. A common species, sometimes becoming a small tree, growing in low woods and also in openings and thickets in the uplands.

Ilex caroliniana (Walt.) Trel. This species has been found growing along the north side of the bluff at McNab.

CELASTRACEAE

Evonymus atropurpureus Jacq. Rarely found in open woods and thickets in the uplands.

Evonymus americana L. On moist sandy banks and in woods along small creeks in the Cretaceous area.

ACERACEAE

Acer saccharum var. *glaucum* Sarg. A common tree in the sand hills section, especially on hillsides and along small streams.

Acer floridanum Pax. Abundant in low sandy woods in the Cretaceous area.

Acer rubrum L. Common in low woods and less frequent in the uplands of the sand hills section.

Acer rubrum var. *tridens* Wood. On bluffs and ridges in the sand hills section.

Acer rubrum var. *Drummondii* (H. & A.) Sarg. Common in swampy woods and bogs.

Acer Negundo L. Common in low woods and along streams.

Acer Negundo var. *texanum* Pax. Growing in similar situations to the last and somewhat more common.

Acer Negundo var. *texanum* f. *latifolium* Sarg. This is a common form, growing with the last.

HIPPOCASTANACEAE

Aesculus glabra var. *leucodermis* Sarg. Usually a shrub two or three meters in height; it is found on hillsides and along small streams in the Cretaceous area.

Aesculus glabra var. *micrantha* Sarg. A low shrub, of which the type was collected in this vicinity.

Aesculus discolor var. *mollis* Sarg. This red-flowered species is often abundant on hillsides and along small streams in the sand hills.

× *Aesculus Bushii* Schneid. A supposed hybrid between *Ae. glabra* var. *leucodermis* and *Ae. discolor* var. *mollis*, of which the type specimens were collected by B. F. Bush, near McNab.

SAPINDACEAE

Sapindus Drummondii H. & A. Rather rare in low woods and on gravelly ridges.

RHAMNACEAE

Rhamnus caroliniana Walt. Often abundant in thickets and on gravelly ridges, and sometimes also found in low woods.

Ceanothus americanus L. A low shrub of sandy woods and thickets.

Berchemia scandens (Hill) Trel. Common in thickets, barrens and along the borders of upland woods.

VITACEAE

Vitis cinerea Engelm. Often common in low woods and thickets.

Vitis cordifolia Michx. Rather common in low woods and also found in thickets and along small streams in the uplands.

Vitis palmata Vahl. Grows along the margins of sandy bogs and on banks of small streams.

Vitis Linsecomii var. *glauca* Munson. A species found in sandy upland woods and on the banks of small streams.

Ampelopsis cordata Michx. Growing in thickets and along small streams.

Ampelopsis arborea (L.) Koehne. Common in thickets and in open situations both in the lowland and upland woods.

Parthenocissus quinquefolia (L.) Planch. Rather frequent in woods and thickets throughout.

Parthenocissus quinquefolia var. *Saint-Paulii* (Graeb.) Rehd. A high climber on trees in the low woods.

TILIACEAE

Tilia nuda Sarg. A large tree of the low woods.

Tilia floridana Small. This is the commonest Linden in the Fulton region, growing in low woods and also along hillsides in the sand hills section.

Tilia caroliniana Mill. Growing in sandy woods, especially along small creeks.

Tilia caroliniana var. *rhoophila* Sarg. A southern species that apparently reaches its northern limit of range here. It grows usually in moist sandy woods.

GUTTIFERAE

Hypericum prolificum L. Not uncommon in thickets and sandy woods.

Ascyrum multicaule Michx. An erect slender shrub, up to nearly one meter in height, growing in low sandy woods.

Ascyrum stans Michx. Uncommon in low sandy woods and on moist banks.

ARALIACEAE

Aralia spinosa L. Occasionally found in low sandy woods and along borders of bogs.

CORNACEAE

Cornus florida L. Commonly growing in open upland woods, especially in the sand hills section.

Cornus asperifolia Michx. Growing both in openings in low woods and in thickets and borders of the upland woods.

Cornus racemosa Lam. Bluffs and hillsides, especially in the sand hills section.

Cornus stricta Lam. This species is confined to the low wet woods, swamps and bogs.

NYSSACEAE

Nyssa sylvatica Marsh. A common and widely distributed tree, being found sometimes in the low woods, but more common in the flat uplands and in the sand hills section.

ERICACEAE

Vaccinium arboreum Marsh. A common small tree, or sometimes a shrub, in the flat upland woods, and also in the sand hills.

Vaccinium arboreum var. *glaucescens* (Small) Sarg. Growing usually on bluffs or hillsides in the sand hills section.

Vaccinium virgatum Ait. A slender shrub found on moist sandy banks and in low sandy woods.

Vaccinium vacillans Kalm. This species usually grows in dryer situations than the last. It is often common in the sandy woods.

Vaccinium corymbosum L. A species confined to the sandy bogs and wet sandy woods. It is a shrub, often growing with a single tree-like stem, up to a height of two or three meters.

Lyonia ligustrina (L.) DC. This shrub is confined to the low sandy woods and sandy bogs.

Rhododendron oblongifolium (Small) Millais. This pretty flowering shrub of the southern states is local and rather rare in sandy bogs near McNab.

SAPOTACEAE

Bumelia lanuginosa (Michx.) Pers. A common small tree, sometimes found in the low woods, but more abundant in the uplands and especially in the sand hills section.

EBENACEAE

Diospyros virginiana L. A not uncommon species, growing both in the lowlands and flat open woods. It is most abundant in thickets and opening along the borders of the uplands. So far as I have observed the larger fruited form (var. *platycarpa* Sarg.) does not grow here.

STYRACEAE

Styrax americana Lam. Growing in low swampy woods and in sandy bogs.

SYMPLOCACEAE

Symplocos tinctoria (L.) L'Hér. A small slender tree, growing in low sandy woods and on the borders of bogs near McNab.

OLEACEAE

Fraxinus americana L. A common forest tree, growing sometimes in low woods, but most abundant in the flat uplands. It also is found on bluffs and ridges in the sand hills section.

Fraxinus pennsylvanica var. *lanceolata* (Borkh.) Sarg. A common tree, sometimes growing to a large size, in low woods and along the margins of swamps and bogs.

Fraxinus quadrangulata Michx. This species is apparently rare and has been noted only on bluffs with northern exposure near McNab.

Forestiera acuminata Poir. A common shrub in low woods, swamps and bogs.

Forestiera acuminata var. **vestita,** var. nov. Varying from the type in having the leaves, petioles and young branchlets more or less densely clothed with straight short pubescence, which is persistent to the end of the season and even in some cases is found on the slender branchlets of the second season; on the typical form there is only sometimes a slight trace of pubescens on the petioles and veins of the young leaves. A specimen collected by B. F. Bush, No. 2468, Miller County,

Arkansas, April 27, 1905, and distributed as *Adelia pubescens* (Nutt.) Ktze., may be taken as the type of this variety. Mr. Bush's specimens were in flower and young leaf. The pubescent variety is also represented by the following additional specimens in the Arnold Arboretum Herbarium:

ARKANSAS. Van Buren, Crawford County, *E. J. Palmer*, No. 21008, April 29, 1922, with young fruit; Fulton, Hempstead County, *B. F. Bush*, no. 5458, April 5, 1909, with flowers, young leaves and pubescent old branchlets; Miller County (opposite Fulton), *E. J. Palmer*, No. 22268, October 11, 1922, with old leaves densely pubescent beneath, and pubescent branchlets.

LOUISIANA. Richland, Rapides Parish, *R. S. Cocks*, No. 19, June, 1908.

APOCYNACEAE

Trachelospermum difforme (Walt.) A Gray. Low woods, thickets and borders of bogs.

VERBENACEAE

Callicarpa americana L. A rather common shrub found sometimes in openings of low woods, but more abundant in the uplands and sandy section.

BIGNONIACEAE

Catalpa speciosa Engelm. Several small specimens of this species were seen along a small sandy creek near McNab, but I am inclined to think it is a recent introduction here from cultivated trees.

Campsis radicans (L.) Seem. Growing along small streams in the sandy section and sometimes along open banks throughout.

Bignonia capreolata L. A high climbing vine, not uncommon in woods.

RUBIACEAE

Cephalanthus occidentalis L. Very common in opening of low woods and in swamps and bogs.

Cephalanthus occidentalis var. *pubescens* Raf. The pubescent form is sometimes found along sandy streams and in sandy bogs.

CAPRIFOLIACEAE

Viburnum rufidulum Raf. A common small tree growing both in bottoms and uplands, but most abundant in thickets and openings along the escarpment.

Symphoricarpos orbiculatus Moench. Sometimes found in thickets and openings in woods, but not very common.

Lonicera sempervirens L. Found in thickets along small streams, especially in the sand hills section. Some of the specimens collected here have rather narrow oblong leaves, finely pubescent beneath, and small flowers, and may represent a distinct variety.

Sambucus canadensis L. Often common in open woods in the bottoms and in thickets along small streams.

Sambucus canadensis var. *submollis* Rehd. This pubescent form is often abundant along small creeks in the sand-hill sections.

In looking over the above list, comprising nearly two hundred species and varieties of woody plants, and comapring it with similar lists from other parts of the general region, it will readily be seen that the representation of the forest flora is very full in the small area within a radius of about five kilometers of Fulton, which has been described, and that besides a few plants peculiar to the region there are several others both of northern and southern range whose presence is rather surprising here. The locality, it should be remembered, is well within the boundaries of the southern division of the Atlantic forest belt and therefore no such diversity is to be expected as might occur along the boundary of two life zones or sub-regions, such as we begin to encounter a few degrees of longitude father west.

Among plants having a range to the north and east and which appear to reach about the southwestern limits of their range here may be mentioned *Carya ovalis* var. *obcordata* Sarg., *Malus ioensis* var. *Palmeri* Rehd., *Rosa carolina* L., *Robinia Pseudoacacia* L., *Aesculus glabra* var. *leucodermis* Sarg., *Ceanothus americanus* L. and *Fraxinus quadrangulata* Michx. The Crabapples are extremely rare or entirely absent over most of eastern Texas, and when the genus does reappear in the canyons of the Edwards plateau it is represented by a distinct variety (*Malus ioensis* var. *texana* Rehd.). *Robinia Pseudoacacia* L. is undoubtedly native in the mountainous regions of eastern Oklahoma, being very abundant on the sandstone slopes of some of the hills in the Kiamichi range. That it once extended much farther south and west than its present general range is indicated by its presence in protected situations here, where it is probably making its last stand. In much the same case is *Fraxinus quadrangulata* Michx., which is also essentially a species of rocky hills and mountainous regions. On the other hand are such southern and southwestern trees as *Carya myristicaeformis* Nutt., *Quercus Durandii* Buckl., *Sophora affinis* T. & G., *Amorpha paniculata* T. & G., *Tilia caroliniana* var. *rhoophila* Sarg., *Sabal minor* Pers. and *Symplocos tinctoria* L'Hér., which seldom appear so far north, at least west of the Mississippi.

There is another group, to which belong *Quercus arkansana* Sarg., *Prunus umbellata* var. *tarda* Wight, *P. mexicana* var. *polyandra* Sarg., *P. mexicana* var. *fultonensis* Sarg., *Crataegus lacera* Sarg., *C. brachyphylla* Sarg., and in a somewhat different degree such species as *Carya myristicaeformis* Nutt. *Ulmus serotina* Sarg., which are so far as now known either local about the Fulton region or if of wider distribution crop up only here and there in widely detached localities, and are probably surviving remnants of species once common and widely dispersed. *Quercus arkansana* is a form of considerable scientific interest. As already stated it appears to be more nearly related to *Q. nigra* and *Q. marilandica* than to any other known species, and in some respects it is intermediate between them. Both of these common southern Oaks have been recorded by Professor E. W. Berry as occurring in the Pleistocene of the Atlantic coast, and I have

myself found fruit and leaves of *Quercus nigra* in deposits of the same period near Palestine in eastern Texas. And while the little known *Quercus arkansana* has not as yet been recorded in a fossil state its characters and the circumstances of its distribution suggests the possibility at least that it may be a surviving representative of an ancient form perhaps ancestral to both of its nearest living allies. Somewhat similar is the case with regard to the Nutmeg Hickory (*Carya myristicaeformis* Nutt.), which, as mentioned by Professor Sargent (Botanical Gazette, LXVI, 233), is the only living species connecting two quite distinct sections of the Hickories. Its comparative rarity and peculiar distribution would also indicate that it is an ancient and disappearing species that may formerly have been much more abundant. It is of course quite impossible now to trace except in the most general way the complex succession of influences that resulted in the present composition and distribution of our forests. In their earlier stages they were probably profoundly affected by the advance and retreat of the glaciers, or by oreogenic movements with consequent changes in drainage systems or the obliteration of great inland bodies of water, or by the appearance or severance of land connections or barriers, any of which might result in profound climatic changes. In response to these influences the movements of advance or retreat would proceed until they become inoperative or perhaps were reversed by some new development. In the progress of such movements, especially along lines of retreat, many stragglers and small colonies would be scattered and make stands in spots particularly favored by topography, soil or other local conditions, and as the turning point was approached these would naturally have become more numerous. In the course of such fluctuations cross currents must often have met and so brought together diverse elements from widely separated sources.

In localities like the one we are considering, in the Red River valley near Fulton, Arkansas, there seems to be evidence that something of this this sort has taken place. Indeed such shiftings and minglings have doubtless occurred many times in all parts of the forest area, the only difference being that in certain places the effect was more marked and the evidence has been better preserved. Among the influences that we may recognize at present as accounting for the richness and diversity of the flora and the preservation of a number of unusual species in this locality are the proximity of the great river and the character and position of its valley, lying as it does just south of the semi-mountainous Ozark region; the diversity of drainage conditions and soils, and especially the presence of the light marly sands and the rather peculiar ridge and ravine topography developed in this formation. Just what, however, were the influences or sequence of events that account for the bringing together of this rather remarkable collection of ligneous plants in so small a space it is also impossible to determine. In its earlier stages it was doubtless involved with those great

continental movements late in the Tertiary that elevated the western lands and sent down the floods that spread the Lafayette gravels across the Gulf States from the base of the Rocky Mountains to the Mississippi River, that elevated the Ozark plateau and Boston Mountains on the north and drove the waters of the Gulf far to the south before the advancing plain. At any rate it seems evident that in places like this we may recognize the approximate lines along which some of these fluctuations of the ancient forest culminated. So that the investigator here may feel an emotion somewhat like that of a traveller standing on some famous historic spot which brings him face to face with the past. Only here he may be sure he is dealing with events that far transcend the dates of all human history, and the silent forest yet stands as a living link between the present and the past.

THE RHODODENDRONS OF NORTHEASTERN ASIA EXCLUSIVE OF THOSE BELONGING TO THE SUBGENUS ANTHODENDRON

Ernest H. Wilson

The Rhododendrons dealt with here are found scattered over an immense territory from the Altai Mountains in about Long. 90° E. eastward to the Pacific Ocean in Long. 145° E.; in latitude from about 60° N. to 30° N. One species (*R. kamtschaticum* Pall.) extends through the Aleutian Islands to Alaska and finds the southern limit of its distribution on Banks Island in British Columbia. Three of the species (*R. Metternichii* S. & Z., *R. Keiskei* Miq. and *R. semibarbatum* Maxim.) are purely Japanese. One (*R. brachycarpum* D. Don) is Japanese and Korean; another (*R. micranthum* Turcz.) extends from Korea through south Manchuria, south Mongolia and northern to western China and has its southern limit of distribution on the mountains of Hupeh province and its western on that of Szech'uan on the Chino-Thibetan border-land. The other species are very wide-spread in northeastern Asia though *R. Adamsii* Rehd. seems to be limited to east-central Siberia and more especially to the mountains of the Baikal region and the valley of the Lena River. One might expect to find a greater number of species in so vast a territory but it should be remembered that as a rule in boreal regions species are few and widely distributed. In Japan especially one would have thought that a more intimate knowledge of the rich flora would have revealed additional species of Rhododendron than were known to Maximowicz in 1870. It is true that Japanese botanists have described one or two species but I do not think these can be maintained.

In his work on the Rhododendrons of eastern Asia, Maximowicz enumerates 31 species indigenous in that region. Of these 17 species are what are popularly known as Azaleas and have been described by

Wilson & Rehder in their Monograph of Azaleas. Of the remaining species China claims three (*R. Fortunei* Lindl., *R. Championae* Hook. and *R. oratum* Planch.) and the others are distributed through the territory dealt with in this article. Three species only were known from China in 1870, whereas today they run into hundreds. On the contrary there have been no additions to the number known to Maximowicz from Japan and continental northeastern Asia.

The Rhododendrons of northeastern Asia have in general been known since a very long time and at least three species were known in Linnaeus' time. Yet they have been slow in reaching the gardens of the west and except *R. dauricum* Linn. and *R. micranthum* Turcz. have not yet found a proper foot-hold in cultivation. They are all quite as hardy here as *R. catawbiense* Michx. but like many other plants from high northern regions, they are difficult to grow. Several of them fall victims nearly every year to destructive spring frosts whilst in the case of others the right conditions are hard to find. In England where choice among many species and a plethora of hybrids obtains it is doubtful if the Rhododendrons of northeastern Asia will ever be considered of much general importance in gardens. In eastern North America where the climate is more severe it is different. For this part of the world *R. brachycarpum* D. Don and *R. Metternichii* S. & Z. are most valuable plants and in the future will probably play a highly important part in the evolution by hybridization of a race of Rhododendrons suitable to the extreme climatic conditions which obtain here. *R. dauricum* Linn., especially its var. *mucronulatum* Maxim., is one of our best spring-flowering Rhododendrons and *R. micranthum* Turcz. has the distinction of being the only species known from China that is hardy in the Arnold Arboretum.

KEY TO THE SUBGENERA

Shrubs or trees with persistent, rarely deciduous, glabrous, lepidote or tomentose leaves; stamens 5–20; ovary glabrous, lepidote or tomentose, never setose, sometimes more than 5-celled, corolla 5, 7 or 9-lobed . . I. *Eurhododendron.*

Shrubs with deciduous, non-lepidote leaves; corolla rotate to sub-rotate; stamens 5; flowers solitary, rarely 2, from lateral, clustered buds. . . II. *Azaleastrum.*

Shrublets with deciduous, non-lepidote leaves; corolla rotate; stamens 10, flowers 1 or racemosely 2 or more from a terminal bud; bracts foliaceous. III. *Therorhodion.*

SUBGEN. I. EURHODODENDRON ENDL.

Rhododendron subgen. **Eurhododendron** Endlicher, Gen. Pl. 759 (1839), emended.

Rhododendron sect. I *Ponticum* G. Don, Gen. Syst. III. 843 (1834), including sections II, III and IV.

Rhododendron sect. III *Eurhododendron* DC. Candolle, Prodr. VII. 721 (1839), including sections I, II, and IV.

KEY TO THE SECTIONS

Leaves persistent, glabrous or tomentose beneath, never lepidote; ovary glabrous, glandular or tomentose, never scaly; stamens 10 to 20; flowers several from a terminal bud.....1. *Leiorhodium*
Leaves persistent, more or less clothed with lepidote glands; corolla rotate, campanulate or funnel-form; stamens 10; ovary lepidote; flowers several from a terminal bud.....2. *Lepipherum*
Leaves persistent, more or less lepidote; corolla salver-shaped, with cylindric tube and spreading limb, villose within the tube; stamens 5–10; ovary densely lepidote, 5-celled; flowers several from a terminal bud.....3. *Pogonanthum*
Leaves usually deciduous, lepidote; corolla campanulate; stamens 10; flowers solitary from lateral, clustered buds.....4. *Rhodorastrum*

SECT. 2. **LEIORHODIUM** REHD.

Rhododendron sect. **Leiorhodium** Rehder in Bailey, Stand. Cycl. Hort. v. 2937 (1916).

Rhododendron sect. *Eurhododendron* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 14 (Rhod. As. Or.) (1870), not Endlicher.

KEY TO THE SPECIES

Bud-scales deciduous; flowers pale- to rose-pink. Leaves covered with felt-like tomentum on the under side.
Leaves narrowed at base; corolla 5- to 7-lobed..... 1. *R. Metternichii.*
Leaves rounded or sub-auricled at base; corolla 5-lobed .. 2. *R. brachycarpum.*
Bud-scales persistent; flowers pale yellow. Leaves glabrous on the under side. 3. *R. chrysanthum.*

Rhododendron Metternichii Siebold & Zuccarini, Fl. Jap. I. 23, t. 9 (1835); in Abh. Akad. Münch. IV. pt. 3, 6 (Fl. Jap. Fam. Nat. II. 130) (1846).—De Candolle, Prodr. VII. 721 (1839).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 21 (Rhod. As. Or.) (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 287 (1875).—Mangles in Gard. Chron. ser. 2, XVIII. 85 (1882).—Nicholson, Dict. Gard. III. 296 (1887).—Shirasawa, Icon. Ess. For. Jap. II. t. 60, figs. 1–13 (1908).—Bean, Trees & Shrubs Brit. Isl. II. 367 (1914). –Rehder in Bailey, Stand. Cycl. Hort. v. 2940 (1916).—Millais, Rhodod. 209 (1917).

Rhododendron maximum Thunberg, Fl. Jap. 181 (1784), not Linnaeus.
Hymenanthes japonica Blume, Bijd. Fl. Ned. Ind. 862 (1826).—G. Don, Gen. Syst. III. 849 (1834).
Rhododendron Metternichii α. heptamerum Maximowicz in Mem. Acad. Sci. St. Pétersb., sér. 7, XVI. no. 9, 21 (*Rhod. As. Or.*) (1870).
Rhododendron Hymenanthes Makino in Tokyo Bot. Mag. XVI. 33 (1902).—Matsumura, Ind. Pl. Jap. II. pt. 2, 460 (1912).
Rhododendron Hymenanthes α. heptamerum Makino in Tokyo Bot. Mag. XVI. 33 (1902).—Matsumura, Ind. Pl. Jap. II. pt. 2, 460 (1912).
Rhododendron japonicum Schneider, Ill. Handb. Laubholzk. II. 490, figs. 323 o-p, 324 b-c (1909), not Suringar.

Shrub from 1–4 m. tall, branches stout, numerous. Leaves stoutly petioled, oblong-lanceolate to oblanceolate, 5–12 cm. long, 1.5–4.5 cm. wide, rounded, obtuse or short-cuspidate, base narrowed, rarely rounded, dark lustrous green and glabrous above, densely clothed with floccose to crustaceous gray to rufous-colored tomentum below. Flowers pale to deep

rose-pink, in loose umbellate corymbs, campanulate, 4.5–6.5 cm. across; pedicels slender, 2–4 cm. long, clothed with gray to ferrugineous curled hairs; calyx a mere rim with 5 or 7 minute teeth, pubescent; corolla 5- or 7-lobed, lobes rounded, spreading; stamens 10–14, shorter than corolla, filaments puberulous to pubescent in lower half; pistil exceeding stamens, ovary ovoid, densely tomentose with curled red-brown hairs, style glabrous, stigma slightly capitate. Fruit oblong, 1–2 cm. long, furrowed, valves thin, glabrescent; seed brown, oblong, slightly winged.

Habitat. Japan, from Kyushu north through Shikoku and Hondo to Adzuma-san in Uzen province.

This is the common evergreen Rhododendron of Japan and is not known to grow wild outside of that country. It is unknown in Hokkaido and does not occur in extreme northern Hondo. From Adzuma-san on the borders of Uzen and Iwashiro provinces southward it is a common plant being found at lower levels than its relative *R. brachycarpum* D. Don. Through the Nikko region, on Mt. Fuji and on the mountains of Shinano province it is particularly abundant between 3000 and 7000 ft. above sea-level. It grows with miscellaneous forest plants and from the middle of May to end of June, according to latitude, is one of the floral features of the forests. It exhibits quite a range of variation in size of leaf and color of flowers. In the form on which Siebold and Zuccarini based the species the flowers are 7-partite. Matsumura gives the mountains of Kyushu and of Shikoku as the habitat of this plant. I did not see this form in Japan and it is known to me only from a specimen collected round Takeo in Kyushu by Père U. Faurie. This has flowers 2½ inches across and the indumentum is rust-colored. This Rhododendron is mentioned by Kaempfer (Amoen. Exot. fasc. v. 877 [1712]) under the vernacular name of "Seki Nan, vulgo Sáku Nange," and he states that there are two forms one with white and another with smaller reddish flowers. Kaempfer must have seen it in Japanese gardens for it is unlikely that he or any of the writers before Maximowicz saw this plant in a wild state. So far as I can discover this 7-merous form has not been introduced into cultivation in Europe or America. Judging by the solitary example before me it appears to be a finer plant than the variety we have in our gardens.

Rhododendron Metternichii var. **pentamerum** Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 22 (Rhod. As. Or.) (1870).—Bean, Trees & Shrubs, Brit. Isl. II. 367 (1914).

Rhododendron Hymenanthes β. *pentamerum* Makino in Tokyo Bot. Mag. XVI. 33 (1902).—Matsumura, Ind. Pl. Jap. II. pt. 2, 460 (1912).

Rhododendron japonicum var. *pentamerum* Hutchinson in Bot. Mag. CXXXVII. t. 8403 (1911).

Rhododendron Nakaii Komatsu in Matsumura, Pl. Koisikav. I. 145, t. 73 (1913).

This form, which is really typical of the species, is distinguished by its 5-merous flowers which naturally are smaller than those of the 7-merous

type. This is the form that is so widely spread in Japan and such a feature of the woodlands on the mountains of central Hondo as far north as the Nikko region. The scales of the winter-buds are clothed with yellow- to red-brown curled hairs. The leaves vary in size and the tomentum may be light- to rufous-gray and either loose or compact in texture, this being somewhat dependent on age and exposure. The flowers vary considerably in size and in color from pale- to rose-pink. I have a co-type of *R. Nakaii* Komatsu collected on Shirane-san in the Nikko region. It has unusually long petioles and small pale-colored flowers but I do not think it has any claim to a distinct name even as a form.

According to Nicholson *R. Metternichii* was introduced into England in 1870; Mangles writing in the Gardeners' Chronicle, 1882, speaks of it being grown in France and England and tells of receiving the pentamerous form from Luscombe. The story is not very clear and it seems strange that the species should be so little known in England today. Into America, this Rhododendron was first introduced by Professor Sargent who sent seeds from the Nikko region in the autumn of 1892, some of these were sent to England. In the Arnold Arboretum it has grown well and proved perfectly hardy and flowers freely. With *R. brachycarpum* D. Don it promises with us to be the most satisfactory of the broad-leaf evergreen Rhododendrons of eastern Asia. In England where there is such great variety to choose from, these Japanese species may be thought lightly of but in eastern North America they are extremely valuable hardy plants.

Rhododendron Metternichii var. **angustifolium** Bean, Trees & Shrubs Brit. Isl. II. 368 (1914).

Rhododendron Metternichii β. pentamerum f. *angustifolia* Makino in Tokyo Bot. Mag. x. 212 (1896).

Rhododendron Hymenanthes f. *angustifolium* Makino in Tokyo Bot. Mag. XVI. 33 (1902).—Matsumura, Ind. Pl. Jap. II. pt. 2, 460 (1912).

Rhododendron stenophyllum Makino in Tokyo Bot. Mag. XXIV. 99 (1910). —Komatsu in Matsumura, Pl. Koisikav. I. 60, t. 35 (1912).

This variety is distinguished by its leaves which are narrower and longer than those of the type. Bean says the branches are stiffly erect and that the plant is quite distinct. It is known to me only from a specimen from the Kew plant which we are told was introduced from Tokyo in 1894. The indumentum is ferrugineous. Makino founded this variety on a specimen cultivated in the Botanic Garden, Tokyo, and probably the Kew plant is from the type. Makino states that it is said to grow wild on the mountains of the northern boundaries of Mikawa and Totomi provinces in Hondo.

There is a hybrid which may be named

× **Rhododendron Watereri** Wilson, n. hyb.

Rhododendron Metternichii var. *pentamerum* × *catawbiense hybrid* Hort. Anthony Waterer.

Young shoots clothed with gray to gray-brown floccose tomentum, early becoming glabrous. Leaves when young covered with short, curled hairs and on the underside with a short dun-colored felt, later becoming glabrescent, sub-acute, base abruptly narrowed. Flowers pale- to deep rose-pink, pedicels floccosely pubescent with occasional short stipitate glands; calyx saucer-shape with 5, short, rounded often glandular-ciliolate teeth; corolla wide funnel-form, 5-lobed, lobes spreading, rounded, sometimes emarginate; filaments pilose in lower half; ovary glabrescent.

This hybrid is fairly intermediate between the species cited as its parents though the glabrescent ovary, the usually glandular calyx and occasional stipitate glands on the pedicels denote the presence of other and foreign influence. The habit of the plant and the character of the young shoots and leaves strongly suggest *R. Metternichii* S. & Z. while the broader leaf-base and glabrescent adult foliage recalls *R. catawbiense* Michx. The flower truss is compact and rounded and the flowers, though not large, are numerous and of pleasing shades of pink. As the type (No. 5905, Arnold Arboretum) I have selected the form with deep rose-pink flowers but the others are equally lovely.

This hybrid was raised by Anthony Waterer at Knap Hill, Surrey, and has been growing in the Arnold Arboretum since 1909. It has proved perfectly hardy and is of vigorous habit and promises to be a most useful Rhododendron for the gardens of New England. The presence of a felt of hairs on the underside of the leaf is a decided advantage to any Rhododendron in New England since it is a protection against the Rhododendron fly which is a troublesome pest in many parts of eastern North America.

Rhododendron brachycarpum D. Don apud G. Don, Gen. Syst. III. 843 (1834).—De Candolle, Prodr. VII. 723 (1839).—A. Gray in Mem. Am. Acad. n. s. VI. 400 (Bot. Jap.) (1858–59).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 22 (Rhod. As. Or.) (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 288 (1875).—Sargent in Gard. & Forest, I. 292, fig. 46 (1888).—Hooker f. in Bot. Mag. CXXIX. t. 7881 (1903).—Komarov in Act. Hort. Petrop. XXV. 207 (Fl. Mandsh. III.) (1907).—Schneider, Ill. Handb. Laubholzk. II. 493, fig. 326–a (1909).—Nakai in Jour. Coll. Sci. Tokyo, XXXI. 74 (Fl. Kor. II.) (1911); Fl. Sylv. Kor. pt. VIII. 41, t. 14 (1919).—Matsumura, Ind. Pl. Jap. II. pt. 2, 458 (1912).—Bean, Trees & Shrubs Brit. Isl. II. 345 (1914).—Rehder in Bailey, Stand. Cycl. Hort. V. 2940, fig. 3384 (1916).—Millais, Rhodod. 129 (1917).

Bush 0.5–4 m. tall, much-branched, young shoots clothed with gray tomentum. Leaves petioled, elliptic to oblanceolate-oblong, 5–20 cm. long, 2–9 cm. wide, rounded, short-apiculate at apex, base cuneate, truncate or sub-auriculate, dark green, reticulate above, and clothed with a felt of gray to dun-colored, stellate tomentum below, petiole stout, 1–3 cm. long, clad with gray tomentum. Flowers white or yellowish striped and flushed pink with greenish, green or brown honey-guides, about 5 cm.

across, borne in compact, rounded trusses, rachis 1–4 cm. long, pedicels slightly villose; calyx minute, 5-toothed; corolla broad-funnel-form 5-lobed; stamens 10, unequal, included, filaments villose near base, anthers pale, pistil shorter than longest stamens, ovary densely felted with pale brown tomentum, style glabrous, stigma small, slightly lobed. Fruit cylindric, 1.5–2 cm. long, furrowed, glabrescent; seed dark brown, ovoid, surrounded by small wing.

Habitat. Japan, high mountains of Shikoku and Hondo to Hokkaido; Korea, Dagelet Island, and Diamond Mountains.

This handsome species is widely distributed in Japan where I am familiar with it from Shiraga-yama in Tosa province northward to Rubeshibe in north Hokkaido. It is a common undergrowth in the coniferous forests and above the tree limit on the higher mountains of Shinano province, the Nikko region, Mt. Fuji, Adzuma-yama and on other mountains it often forms dense thickets. Its altitudinal range is between 2000 and 8500 ft. The leaves vary considerably in size and those on specimens I collected in Korea and Hokkaido are the broadest I have seen. The flowers vary in degree of whiteness, some being decidedly yellowish, and in the amount of pink. A specimen I collected in Tosa has fruit 2 cm. long and 0.8 cm. wide and leaves 20 cm. long.

This species was first introduced into cultivation by Dr. G. R. Hall who sent a plant from Japan by Mr. G. Gordon Dexter of Boston, in 1861. This was given to Francis Parkman, Jamaica Plain, Mass., in whose garden it grew for a number of years when it was transferred to the Arnold Arboretum. The flowers were straw-colored without any pink. Its introduction into Europe was much later, according to the Botanical Magazine in 1895, while Millais gives 1888. In Massachusetts it has proved a hardy and valuable plant and in spite of the severe winters the foliage does not brown nor do the flower-buds suffer. Its growth is slow and seedlings seem difficult to establish. On account of its great hardiness it is one of the most valuable Rhododendron for New England gardens and it seems strange that the hybridist has not worked on this species. Mr. J. C. Williams of Caerhays in Cornwall, England, has crossed it with *R. campylocarpum* Hook. f. but I do not know the garden value of this hybrid.

The form with rose-pink flowers has been named

Rhododendron brachycarpum var. **rosaeflorum** Miyoshi in Jour. Coll. Sci. Tokyo, XXVII. art. 11, 8 (1910).

Rhododendron brachycarpum var. *roseum* Koidzumi in Tokyo Bot. Mag. XXX. 77 (1916).

This color-form occurs mixed with the type. Koidzumi records it from the high mountains of Hokkaido. I purchased specimens from a florist in Kyoto and these have larger flowers than is usual in the species, being 6.5 cm. across.

The form with nearly white flowers has been distinguished as

Rhododendron brachycarpum var. **leucanthum** Koidzumi in Tokyo Bot. Mag. XXVIII. (59) (1914), name only.

On Dagelet Island in the Japan Sea and on the Diamond Mountains in Korea I gathered this albino form which seems to be dominant there.

A form with petaloid stamens has been named

Rhododendron brachycarpum var. **Nemotoanum** Makino in Tokyo Bot. Mag. XXIII. 22 (1909).

Rhododendron brachycarpum var. *Nemotoi* Miyoshi in Jour. Coll. Sci. Tokyo, XXVII. art. 11, 8, tt. 1, 2 and 3, figs. 1–4 (1910).

This monstrosity was found growing wild on Adzuma-yama in Iwashiro province, northern Hondo.

Rhododendron brachycarpum var. **lutescens** Koidzumi in Tokyo Bot. Mag. XXX. 77 (1916).

Rhododendron Fauriei Franchet in Bull. Soc. Phil. 3 (1886).—Matsumura, Ind. Pl. Jap. II. pt. 2, 459 (1912).

Rhododendron chrysanthum var. *niko-montanum* Komatsu in Matsumura, Icon. Pl. Koisikav. III. 99, t. 195 (1917).

Rhododendron niko-montanum Nakai in Tokyo Bot. Mag. XXXI. 242 (1917).

This variety is distinguished chiefly by the absence of indumentum on the underside of the leaves; the flowers are white to yellowish white with few or no green spots; occasionally the flowers are suffused with pink. It occurs on many of the higher mountains of northern Hondo. Professor Sargent in 1892 and myself in 1914 collected it on Hakkoda-yama in Mutsu province at 5000 ft. altitude where it is abundant. I also gathered it on Adzuma-yama between 4000 and 6000 ft. altitude. I have a specimen collected by Père Faurie (No. 5828) in woods "Ubaya" wherever that is. Komatsu records it from the Nikko mountains and Koidzumi from Mt. Ontake in Shinano province.

This form is in cultivation in the Edinburgh Botanic Garden where I saw it in flower in the summer of 1922. It is an interesting plant but hardly worthy of a distinctive name, anymore than are the color forms whose names are collated above.

Rhododendron chrysanthum Pallas, Reise, III. 729, t. N. fig. 1, 2 (1776); Fl. Ross. I. 44, t. 30 (1784); Voyages, IV. 531, t. 31, fig. 1-2 (1793).—Linnaeus, Pflanzensyst. III. 559, t. 24-b (1778); Suppl. 237 (1781).—Zahn, Diss. Inaug. (1784).—Woodville, Med. Bot. III. 403, t. 149 (1793).—Chaumeton, Chamberet & Poiret, Fl. Méd. VI. 47, t. 301 (1818).—Roques, Phytogr. Méd. I. 291. t. 84 (1821).—G. Don, Gen. Syst. III. 843, fig. 141 (1834).—Loudon, Arb. Brit. II. 1135 (1838).—DeCandolle, Prodr. VII. 723 (1839).—Ledebour, Fl. Ross. II. 920 (1846).—Trautvetter & Meyer in Middendorff., Reis. Sib. I. pt. 2, 63 (Fl. Ochot.) (1858).—Burnett, Pl. Utilior. III. no. 65, t. (1847).—Maximowicz in Mém. Acad. Sci. Sav. Etr.

St. Pétersb. IX. 189 (Prim. Fl. Amur.) (1859); in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 20 (Rhod. As. Or.) (1870).—Fr. Schmidt in Mém. Acad. Sci. St. Pétersb. sér. 7, XII. no. 2, 55 (Reis. im Amur-l.) (1868).—Komarov in Act. Hort. Petrop. XXV. 205 (Fl. Mandsh. III.) (1907).—Schneider, Ill. Handb. Laubholzk. II. 481 (1909).—Nakai in Jour. Coll. Sci. Tokyo, XXXI. 74 (Fl. Kor. II) (1911); Fl. Sylv. Kor. pt. VIII. 40. t. 13 (1919).—Bean, Trees & Shrubs Brit. Isl. II. 349 (1914).—Matsumura, Ind. Pl. Jap. II. pt. 2, 459 (1912).—Miyabe & Miyake, Fl. Sachal. 310, no. 385 (1915).—Millais, Rhodod. 143 (1917).

Rhododendron officinale Salisbury in Hooker, Parad. Londin. II. t. 80 (1807).

Shrub 0.2–1 m. tall, much-branched, bark scaly, branches stout clothed with old persistent bud-scales. Leaves stoutly petioled, coriaceous, glabrous, except for slight pubescence on petiole, shining green, elliptic- to ovate-lanceolate, often broadest above the middle, 2.5–8 cm. long, 1.–3.5 cm. wide, rounded and mucronulate at apex, narrowed at base, margin slightly recurved, rugulose with impressed veins above. Flowers pale yellow, 5–8, in terminal umbels, wide-campanulate, 2.5–3 cm. across, pedicels rigid, erect, 4–6 cm. long, subtended by persistent bud-scales, clothed with tawny floccose tomentum; calyx pubescent, minute, saucer-shape, with 5 rounded teeth; corolla 5-lobed, lobes spreading, rounded; stamens 10, shorter than corolla, filaments flattened, villose at base; pistil exceeding the stamens, ovary ovoid, furrowed, clothed with ferruginous villose tomentum, style glabrous, curved below the capitate, lobed stigma. Fruit erect, dark brown, ovoid to oblong-ovoid, 0.8–1.4 cm. long, glabrescent, seeds shining brown, winged at each end.

Habitat. Altai mountains eastward through Siberia to Kamtschatka, the Kurile Islands and Saghalien; Japan, Hokkaido southward through Hondo to the high mountains of Shinano province; also in Korea.

This wide-spread species is distinguished by its glabrous rugulose leaves, its umbellate yellow flowers on long erect pedicels and by the long-persistent bud-scales which clothe the shoots. It is most closely related to *R. caucasicum* Pall. but the yellow-flowered form of that species has leaves markedly hairy on the underside and the flower-truss has an elongate rachis. In Hokkaido and north Korea where I have seen *R. chrysanthum* wild it has always been on the upper slopes of volcanic mountains. In Hokkaido within the crater of Shiribeshe-san at about 6000 ft. altitude I gathered it in flower on July 27, 1914, with unmelted snow a few feet away. As I know it the species is a much-branched shrub from a few inches to 3 feet high; often it forms dense low thickets covering large areas on bare mountain slopes. I never saw any variation in color of the flowers and except that it is an alpine plant I see no reason why it should not thrive in our gardens. So far all efforts to grow it in the Arnold Arboretum have failed. Seeds I collected in Hokkaido and Korea germinated freely but after struggling for a while the seedlings all died. In the Proctor Arboretum at Topsfield, Massachusetts, it was

growing in 1918, but personally I have never seen a healthy plant in gardens. Bean comments on its bad behavior in England and that it is not figured in the Botanical Magazine proves it is either a rare plant or difficult to grow in England.

This species has been known for a long time and seems to have been first collected by D. G. Messerschmidt in Russian Dahuria sometime between 1720 and 1727. Very soon after it was observed by Messrs. Gmelin & Steller in the valley of the Lena River and eastward. Gmelin in his Fl. Sib. IV. 121, t. 54 (1769) refers to it as "Andromeda foliis ovatis, utrinque venosis, corollis campanulatis obliquis longissimis." Pallas in his travels in Siberia met with it and very probably it was he who introduced it into Russia. In 1796 it was introduced into England from Russia by Mr. Joseph Busch. Millais (Rhodod. 143) claims that after the introduction in 1803 of *R. caucasicum* Pall. the early hybridisers in Scotland raised numerous hybrids between it and *R. chrysanthum* many of which are now among our most valuable spring Rhododendrons. He mentions (p. 139) *R. caucasicum* var. *stramineum* Hook. and *R. caucasicum* var. *flavidum* Nicholson. I can find no trustworthy evidence in support of this and am of the opinion that *R. chrysanthum* has played no part in the production of the so-called "Caucasicum Hybrids" or, indeed, in the production of any hybrid Rhododendron. The early writers confused *R. chrysanthum* with the yellow-flowered form of *R. caucasicum* Pall. and it is this plant that figures in the Rhododendrons mentioned by Millais.

To the hunters in Siberia *R. chrysanthum* was famous as a medicine. An infusion of the young leaves was considered a cure for rheumatism. It was also recommended in venereal diseases. On this account much was written about it toward the close of the 18th and early in the 19th centuries and it is beautifully figured in several of the works cited, especially Hooker's figure in his Paradisus Londinensis.

SECT. 2. LEPIPHERUM G. DON.

Rhododendron sect. **Lepipherum** G. Don, Gen. Syst. III. 845 (1834).

Rhododendron sect. *Osmothamnus* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. 9, 14 (Rhod. As. Or.) (1870), in part.

KEY TO THE SPECIES

Bud-scales deciduous.
Flowers white; corolla rotate-campanulate; filaments glabrous. 4. *R. micranthum.*
Flowers pale yellow; corolla broad-campanulate; filaments slightly pilose at base. 5. *R. Keiskei.*
Bud-scales persistent. Flowers rose-purple; corolla wide-campanulate; filaments villose at base. 6. *R. parvifolium.*

Rhododendron micranthum Turczaninow in Bull. Soc. Nat. Mosc. X. no. 7, 155 (1837); in XXI. pt. 2, 502 (Fl. Baical. Dahur.) (1848).—De

Candolle, Prodr. VII. 727 (1839).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 18, t. 4, figs. 1–10 (Rhod. As. Or.) (1870).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VI. 77 (Pl. David. I. 197) (1883).—Hemsley in Jour. Linn. Soc. XXVI. 27 (1889).—Komarov in Act. Hort. Petrop. XXV. 205 (Fl. Mandsh. III.) (1907).—Chipp in Bot. Mag. CXXXIV. t. 8198 (1908).—Schneider, Ill. Handb. Laubholzk. II. 475, figs. 315 p–q, 316g (1909).—Hemsley & Wilson in Kew Bull. Misc. Inform. 1910, 117.—Pampanini in Nuov. Giorn. Bot. Ital. n. ser. XVII. 683 (1910).—Rehder & Wilson in Sargent, Pl. Wilson. I. 513 (1913).—Bean, Trees & Shrubs Brit. Isl. II. 368 (1914).—Rehder in Bailey, Stand. Cycl. Hort. V. 2938 (1916).—Millais, Rhodod. 210 (1917).—Nakai, Fl. Sylv. Kor. pt. VIII. 30, t. 7 (1919).—Osborn in Garden, LXXXIV, 270, fig. (1920).

Rhododendron Rosthornii Diels in Bot. Jahrb. XXIX. 509 (1900).
Rhododendron Pritzelianum Diels l. c. 510.

A much-branched shrub, 1–2.5 m. tall, with branches rigid, twiggy, lepidote and pubescent; bud-scales lepidote without, ciliolate, caducous. Leaves persistent for one year, scattered, petioled, oblanceolate to lanceolate, 1.5–4 cm. long, 0.5–1.5 cm. wide, acute or obtuse at apex, with a gland-tipped mucro, narrowed at base to the petiole, dark green, finely reticulate, with scattered lepidote glands above, densely covered with pale- to rust-brown lepidote scales below. Flowers white, very numerous, 0.8–1 cm. across in terminal racemose clusters, rhachis pubescent, pedicels ascending-spreading, slender, rigid, 1–2 cm. long, densely lepidote; calyx persistent, shallow, saucer-shape, tube 0.5 mm. long with 5 lanceolate to triangular teeth each 1–1.5 mm. long, lepidote, often ciliolate; corolla rotate-campanulate, lepidote without, 5-lobed, lobes spreading from about the middle; stamens 10, exserted, filaments flattened at the base, glabrous; pistil shorter than the stamens, ovary ovoid, lepidote, style glabrous, stigma simple. Fruit oblong, lepidote, shining dark brown, 0.3–0.8 cm. long, tipped with the persistent style; seeds fusiform, winged at the ends, yellow-brown.

Habitat. Mountains of northern Korea and westward through southern Manchuria, the northern provinces of China to the borders of Thibet with the southern limits of its range in the provinces of Hupeh and Szech'uan.

This interesting Rhododendron was the first known Chinese species. It has a greater range of distribution than any other Chinese Rhododendron extending as it does from the mountains west of Peking to those of the Chino-Tibetan borderland, and, growing in Mongolia and Korea. It has the distinction also of being the only Chinese species hardy in the Arnold Arboretum. As I know it in Hupeh and Szech'uan it grows on cliffs and fully exposed places where it forms masses of irregular shape from 3 to 8 ft. through and tall. It is fairly common as a small bush on the mountains behind Port Arthur in south Manchuria. In foliage and flower it suggests a Ledum rather than a Rhododendron, and the leaves, like those of other gland-dotted species, are fragrant. The species was

named by Turczaninow from material collected on the Po-hua-shan, some sixty miles west of Peking, about 1835, by Dr. P. Y. Kirilov, a Russian, who was physician to the 11th Russian Ecclesiastic Mission to Peking in 1830. It was, however, discovered almost a century earlier by the Jesuit Father, Pierre D'Incarville, who joined the Chinese mission of the Jesuits and died at Peking in 1757. This learned priest paid much attention to the botany of the Peking district and collected herbarium material. It was he who sent to Europe the seeds from which were raised the first north China plants cultivated in Europe including such trees as *Ailanthus altissima* Swingle, *Sophora japonica* Linn. and *Thuja orientalis* Linn. A few of his specimens were described by Lamarck toward the end of the 18th century but most of them remained untouched in the Muséum d'Histoire Naturelle, in Paris, until 1882 when they were determined by Franchet. So far as I can discover there is no record of *R. micranthum* being introduced into gardens until 1900, when I sent seeds from Hupeh, central China, to Messrs. Veitch.

Rhododendron Keiskei Miquel in Ann. Mus. Lugd.-Bat. II. 163 (Prol. Fl. Jap. 95) (1865–66).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 23, t. 4, figs. 11–17 (Rhod. As. Or.) (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 288 (1875).—Hemsley in Bot. Mag. CXXXVI. t. 8300 (1910).—Matsumura, Ind. Pl. Jap. II. pt. 2, 462 (1912).—Bean, Trees & Shrubs Brit. Isl. II. 364 (1914).—Rehder in Bailey, Stand. Cycl. Hort. V. 2938 (1916).—Millais, Rhodod. 198, fig. (1917).—Mottet in Rev. Hort. 1917, 348, t. (1917).

Shrub 1–3 m. tall, much-branched; branches twiggy, sparsely lepidote when young; bud-scales lepidote. Leaves falling in the 2nd year, short-petioled, coriaceous, lanceolate to oblong-lanceolate, sometimes elliptic, 3–6 cm. long, 1–2 cm. wide, acute or rounded and mucronate at apex, narrowed, sometimes rounded, rarely sub-auriculate at base, dark green, finely reticulate, sparsely lepidote above, pale, densely lepidote below; petiole often clad with few bristles and like the midrib of leaf-base usually pubescent. Flowers pale yellow, about 4 c.m across, umbellate-corymbose, 3–6; pedicels densely lepidote; calyx minute, saucer-shape, 5-lobed, lobes rounded, often ciliate, densely lepidote; corolla broad-campanulate, 5-lobed, spreading from a short tube, sparsely lepidote without; stamens 10, exserted, unequal, filaments slightly pilose near base, anthers pale; pistil longer than the stamens, ovary ovoid, densely lepidote, style curved, glabrous, stigma small. Fruit cylindric, 1–1.5 cm. long, 3 mm. wide, deeply furrowed; seed wingless, obovoid, shining brown.

Habitat. Japan, Yaku-shima northward through Kyushu, Shikoku and Hondo to the Nikko region.

This species is interesting chiefly on account of its yellow flowers and is related to *R. lutescens* Franchet and *R. triflorum* Hooker f. The bud-scales, pedicels, calyx, ovary and underside of the leaves are densely and the

outside of the corolla-tube, upper surface of the leaves and the young branchlets sparsely dotted with glistening orange-brown scales. Though widely distributed in Japan from the extreme south to the Nikko region it is nowhere really abundant. It is partial to moist woodlands and is often found growing on humus-clad rocks in coniferous forests. On Mt. Kirishima it is fairly common in the forests between 1000 and 4000 ft. elevation. In the Cryptomeria-forests on the island of Yaku-shima I found it growing occasionally on decaying tree-trunks between 1800 and 3000 ft. above sea-level. In the Nikko region, its northern limit, it is rare. The species is named for Keiskφ Ito, the father of modern botany in Japan.

Rhododendron Keiskei was introduced into cultivation in America by J. G. Jack who sent seeds in the autumn of 1905 from Adera, Shinano province, to the Arboretum of T. E. Proctor, Topsfield, Mass., where it first flowered in May, 1908. It was introduced into Kew from Yokohama in 1908 and flowered in a pot in 1909. In Massachusetts it is not properly hardy but in England it is as hardy as the average species from the Far East.

Komatsu (in Tokyo Bot. Mag. xxxi. [288] (1917)) in Japanese mentions a variety as *R. Keiskei* var. *procumbens*. I think this is only a condition of growth, not worthy of taxonomic recognition.

Millais states that Mr. E. J. P. Magor has crossed *R. Keiskei* with *R. ciliatum* Hook. f., with *R. lutescens* Franch. and with *R. arboreum* Smith. The last-named of these crosses has flowered and has been named

× **Rhododendron Keiskarbor** Magor in Rhodod. Soc. Notes, I. 230 (1920).

Rhododendron Keiskei × *arboreum pink* Hort. Magor.

Rhododendron parvifolium Adams in Mém. Soc. Nat. Mosc. ix. 237 (1834).—Ledebour, Fl. Ross. ii. 921 (1846).—Turczaninow in Bull. Soc. Nat. Mosc. xxi. no. 7, pt. 2, 500 (Fl. Baical. Dahur.) (1848).—Trautvetter & Meyer in Middendorff, Reis. Sib. i. pt. 2, 63 (Fl. Ochot.) (1856).—Regel & Tiling in Nouv. Mém. Soc. Nat. Mosc. xi. 110 (Fl. Ajan.) (1858).—Fr. Schmidt in Mém. Acad. Sci. St. Pétersb. sér. 7, xii. no. 2, 158 (Reis. im Amur-l.) (1868).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 17 (Rhod. As. Or.) (1870).—Regel in Gartenfl. xxvi. 163, t. 904 (1877).—Harrow in Gard. Chron. ser. 3, xxxix. 164, figs. 66, 67 (1906). —Komarov in Act. Hort. Petrop. xxv. 204 (Fl. Mandsh.) (1907).—Schneider, Ill. Handb. Laubholzk. ii. 476, fig. 317-a (1909).—Bean, Trees & Shrubs Brit. Isl. ii. 371 (1914).—Miyabe & Miyake, Fl. Sachal. 309, no. 384 (1915).—Millais, Rhodod. 224 (1917).—Lynch in Gard. Chron. ser. 3, lxiii. 76, figs. 33, 34 (1918).—Nakai, Fl. Sylv. Kor. pt. viii. 29, t. 6 (1919).

Azalea lapponica Pallas, Fl. Ross. ii. 52, t. 70, fig. 1, a (1784), not Wahl.
Rhododendron palustris Turczaninow apud De Candolle, Prodr. vii. 724 (1839).

Rhododendron parvifolium f. *alpina* Glehn in Act. Hort. Petrop. IV. 66 (1876).
Rhododendron parvifolium f. *elata* Glehn l. c.
Rhododendron confertissimum Nakai, Veget. Mt. Waigalbon, 36 (1916), name only; in Tokyo Bot. Mag. XXXI. 239 (1917); Fl. Sylv. Kor. pt. VIII. 32, t. 8 (1919).

Shrub 0.1–1.5 m. tall, branches twiggy, densely clothed with rusty-brown lepidote scales, winterbuds with lepidote, ciliolate bud-scales. Leaves persistent, scattered, petiolate, lanceolate to elliptic-lanceolate, 0.5–2 cm. long, 0.3–1 cm. wide, acute or obtuse and mucronate at apex, narrowed at base to the winged petiole, dark green and lepidote above, densely clothed with pale- to rust-colored lepidote glands below. Flowers rosy purple, clustered from 2 to 5 together at end of shoots, 1.5–2 cm. diam. subtended by persistent bud-scales; pedicels 4–8 mm. long, lepidote, calyx saucer-shape, 5-lobed, lobes oval, 0.5–1.5 mm. long, densely lepidote, often ciliate, occasionally colored; corolla wide-campanulate, deeply 5-lobed, the lobes spreading, lanceolate-ovate; stamens 10 (sometimes 7–10), exserted, shorter than corolla-lobes, filaments villose near base; pistil overtopping stamens, ovary ovoid, furrowed, densely lepidote, style rich purple, stigma capitate. Fruit ovoid to oblong-ovoid, 4–6 mm. long, densely lepidote; seeds wingless, obovoid, yellow-brown.

Habitat. Northeastern Asia, eastern Siberia from about 100° E. long. through the Baikal region eastward to Kamtschatka and Saghalien and south to the higher mountains of north Korea.

This species is widely spread in the colder parts of northeastern Asia but does not reach Japan. At the southern limits of the range it is confined to the upper slopes of the higher mountains of Korea but in the north it descends to sea-level on moors and in Sphagnum swamps. When growing freely it is erect and of rather sparse habit but on windswept mountain-slopes it is reduced to a few inches in height and forms broad mats. On such plants Nakai founded his *R. confertissimum*. Of this I gathered seeds on Mt. Setsurei, northern Korea, at 7000 ft. and plants raised from them grew into the ordinary tall, sparsely branched, typical form. This dwarf plant is purely a response to ecological conditions and cannot be main- tained as a distinct form. From western China certain species of the section Lepipherum have been erroneously referred to *R. parvifolium* but this plant is unknown from China proper.

According to Pallas *R. parvifolium* was discovered by E. Laxmann on the Stanovoi Mountains but was confused with the circumpolar *R. lapponicum* Wahlenb. It has not taken kindly to cultivation in England or America thriving better in Germany and Russia. I have not been able to discover when it was first introduced into cultivation but Regel's fine plate in the *Gartenflora* (XXVI) 163, t. 904 (1877) is the earliest figure of a cultivated plant I have seen. At Edinburgh this plant thrives in the rockery and it is said to grow well in the Cambridge Botanic Garden. In the Arnold Arboretum we have not succeeded in properly establishing it though it is a plant that ought to succeed here.

There is said to be a white-flowered variety

Rhododendron parvifolium var. **albiflorum** Herder apud Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 17 (Rhod. As. Or.) (1870).

This is described as very densely branched with shorter pedicels and white flowers. It was discovered on Mt. Munku-Sardyk at the source of the Irkut River, which is west of the southern end of Lake Baikal, by Gustave Radde between 1855 and 1857. It appears to be unknown in gardens.

SECT. 3. POGONANTHUM G. DON

Rhododendron sect. **Pogonanthum** G. Don, Gen. Syst. III. 845 (1834).

Rhododendron sect. *Osmothamnus* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 14 (Rhod. As. Or.) (1870), in part.

Represented by..... 7. *R. Adamsii*..

Rhododendron Adamsii Rehder in Wilson & Rehder, Monog. Azal. 190 (1921).

Azalea fragrans Adams in Mém. Acad. Sci. St. Pétersb. II. 332, t. 14 (1808).
Osmothamnus fragrans De Candolle, Prodr. VII. 715 (1839).—Ledebour, Fl. Ross. II. 918 (1846), exclud. synon.
Osmothamnus pallidus De Candolle, l. c.—Ledebour, l. c., exclud. synon.
Rhododendron fragrans Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 16 (*Rhod. As Or.*) (1870), not Paxton.—Balfour f. in Millais, Rhodod. 171 (1917).
Rhododendron pallidum Dummer in Gard. Chron. ser. 3, LIII. 264 (1913), not W. Watson

Shrub 0.2–0.5 m. tall, with verticillate, erect branches densely villose when young and clad with fulvous lepidote scales. Leaves persistent, lepidote, short-petioled, coriaceous, elliptic to elliptic-ovate, 1.4–2 cm. long, 0.6–0.8 cm. wide, acute, obtuse at base, margin incurved, dark green above, fulvous beneath. Flowers pink or white, 7–15, crowded together in a terminal racemose corymb; pedicels 1–2 mm. long, lepidote; calyx saucer-shape, 5-toothed, the teeth unequal, ovate to deltoid, 1–2.5 mm. long, often ciliate; corolla salver-shape, 5-lobed, tube about 8 mm. long, glabrous without, villose within, lobes spreading, rounded; stamens 5, included, filaments puberulous at base; pistil shorter than stamens, ovary ovoid, furrowed, villose and lepidote, style stout, club-shape, stigma lobed. Fruit conic, villose, lepidote.

Habitat. Eastern Siberia, Baikal region north-eastward to the valley of Lena River.

This plant is unknown to me and does not appear to have been introduced into gardens. It seems to be confined to the regions mentioned above and not to reach the coast. The Himalayan *R. anthopogon* D. Don has been confused with Adams' plant but the two species are quite distinct. Several other distinct plants from western China and the Himalayas have been erroneously referred to *R. Adamsii* but this plant is unknown

in either of these regions. It was discovered by early Russian travellers in Siberia, probably by Messersch nidt or Steller, and is mentioned by Gmelin (Fl. Sib. IV. 125, t. 55 [1769]) as "Azalea fol. ovalibus supra rugosis" and is figured but the figure is crude.

SECT. 4. RHODORASTRUM MAXIM.

Rhododendron sect. **Rhodorastrum** Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 15 (Rhod. As. Or.) (1870).

Represented by..... 8. *R. dauricum*

Rhododendron dauricum Linnaeus, Spec. 392 (1753).—Pallas, Fl. Ross. I. 47, t. 32 (1784).—Andrews, Bot. Rep. I. t. 4 (1799).—Sims in Bot. Mag. XVII. t. 636 (1803).—Loddiges, Bot. Cab. VII. t. 605 (1822); XV. t. 1446 (1828).—G. Don, Gen. Syst. III. 845 (1834).—Loudon, Arb. Brit. II. 1138, fig. 939 (1838).—DeCandolle, Prodr. VII. 725 (1839).—S. O. in Loudon, Gard. Mag. n. ser. VII. 462 (1841).—Ledebour, Fl. Ross. II. 921 (1846).—Turczaninow in Bull. Soc. Nat. Mosc. XXI. no. 7, pt. 2, 501 (Fl. Baical. Dahur.) (1848).—Maximowicz in Mém. Acad. Sci. Sav. Etr. St. Pétersb. IX. 189 (Prim. Fl. Amur.) (1859); in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 43 (Rhod. As. Or.) (1870).—Trautvetter & Meyer in Middendorff, Reis. Sib. I. pt. 2, 63 (Fl. Ochot.) (1856).—Regel in Mém. Acad. Sci. St. Pétersb. sér. 7, IV. no. 4, 102 (Tent. Fl. Ussur.) (1861).—P. A. in Gartenwelt, VII. 413, fig. (1903).—Komarov in Act. Hort. Petrop. XXV. 200 (Fl. Mandsh. III.) (1907).—Schneider, Ill. Handb. Laubholzk. II. 471, figs. 314 a–b, 316 c–f. (1909).—Nakai in Jour. Coll. Sci. Tokyo, XXXI. 75 (Fl. Kor. II.) (1911); Fl. Sylv. Kor. pt. VIII. 33, t. 9 (1919).—Dallimore in Garden, LXXVII. 18, fig. (1913).—Osborn in Gard. Chron. ser. 3, LIII. 51, fig. 26 (1913).—Bean, Trees & Shrubs Brit. Isl. II. 352 (1914).—Rehder in Bailey, Stand. Cycl. Hort. V. 2938 (1916).—Millais, Rhodod. 152 (1917).

Rhododendron dahuricum β. roseum DeCandolle, Prodr. VII. 725 (1839).
Rhododendron dauricum var. *pallidum* Regel in Gartenfl. XI. 377 (1862).
Rhododendron dauricum α. dauricum Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 44 (Rhod. As. Or.) (1870).—Matsumura, Ind. Pl. Jap. II. pt. 2, 459 (1912).
Azalea dahurica K. Koch, Dendr. II. 181 (1872).
Rhodora canadensis Beziat in Jardin, XX. 57, figs. 31, 32 (1906), not Linnaeus.

A much-branched shrub 1–2 m. tall, branches twiggy, ascending, lepidote, bud-scales densely lepidote. Leaves deciduous or persisting through the winter to the late spring, petioled, elliptic to elliptic-ovate, often lanceolate on free shoots, coriaceous, 1–5 cm. long, 0.6–2 cm. wide, rounded to obtuse, sometimes mucronulate at apex, rounded or narrowed at base, dark green lepidote, finely reticulate above, pale green to rust-brown and densely lepidote below, margin waved. Flowers precocious, solitary or in a cluster at end of the shoot each from separate bud, bright red-purple, 3–3.5 cm. across; peduncle surrounded by persistent bud-scales; calyx minute with 5 deltoid teeth, lepidote; corolla wide-campanu-

late, pubescent without on basal half, 5-lobed, lobes spreading almost horizontally from the short tube, rounded, waved; stamens 10, filaments color of corolla, villose on lower half, anthers nearly black; pistil longer than stamens, ovary green, conic, furrowed, densely lepidote, style crimson, curved, stigma small, dark-colored. Fruit oblong, 0.8–1.2 cm. long, furrowed, lepidote; seeds wingless, obovoid, yellow-brown.

Habitat. Altai mountains in central Siberia eastward to the Japan Sea, Korea and Hokkaido.

This species was one of the earliest known Rhododendrons and is the only one within our region mentioned in the first edition of Linnaeus' Species Plantarum. It was discovered by D. G. Messerschmidt sometime between 1720 and 1727 and is well figured by Amman (Stirp. Rar. Icon. & Des. 181, t. 27 (1739) under the name of "Chamaerhododendros folio glabro, majusculo, amplo flore roseo." Gmelin (Fl. Sib. IV. 125 [1769]) refers to it as "Andromeda foliis ovatis floribus patentibus, subsessilibus." It was introduced into Petrograd by Pallas and, according to Aiton (Hort. Kew. 66 [1789]), into England by Anthony Chamier, Esq., in 1780. With its bright red-purple, flattish flowers *R. dauricum* is really a pretty shrub and is one of the earliest to flower in the spring. It is a boreal plant and probably thrives better in eastern North America than it does in England but even here its expanded flowers are often destroyed by frost. The leaves of the typical form are usually quite deciduous and in autumn change to yellow and blackish bronze. The leaves on crushing or drying are pleasantly fragrant. Quite often this shrub opens flowers freely in late November as was the case last year when on November 20th in the Arnold Arboretum one plant bore over fifty fully expanded flowers.

Rhododendron dauricum var. **sempervirens** Sims in Bot. Mag. XLIV. t. 1888 (February, 1817).—Loddiges in Bot. Cab. XVI. t. 1584 (1829).—DeCandolle, Prodr. VII. 725 (1839).—Mottet in Rev. Hort. 1908, 198, fig. 78.—Bean, Trees & Shrubs Brit. Isl. II. 352 (1914).—Rehder in Bailey, Stand. Cycl. Hort. V. 2939 (1916).

Rhododendron dauricum β. *atrovirens* Ker-Gawler in Bot. Reg. III. t. 194 (May, 1817).—L. Spaeth in Gartenfl. LIII. 267, figs. 39, 40 (1904).

This variety is distinguished by its persistent leaves; the flowers are dark red-purple and about the size of those of the type. It is a native of the Altai region and is supposed to have been introduced into England from Russia by Thomas Bell about 1798. It flowered in the nursery of Messrs. Whitley, Brame & Milne at Parson's Green, in 1817 and was named and figured by Sims.

The typical form has leaves about 2.5 cm. long and 1.2 cm. broad but there is cultivated in the Edinburgh Botanic Gardens a plant with leaves only half this size.

Another evergreen variety the flowers of which have no stamens, is mentioned by Millais as *R. dauricum* var. *emasculum* (Rhodod. 152 [1917]).

Rhododendron dauricum var. **mucronulatum** Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 44 (Rhod. As. Or. (1870).—Hemsley in Jour. Linn. Soc. XXVI. 22 (1889).—Matsumura Ind. Pl. Jap. II. pt. 2, 459 (1912).

Rhododendron mucronulatum Turczaninow in Bull. Soc. Nat. Mosc. X. no. 7, 155 (1837); in Bull. Soc. Nat. Mosc. XXI. pt. 2, 502 (Fl. Baical. Dahur.) (1848).—DeCandolle, Prodr. VII. 727 (1839).—Sargent in Gard. & For. IX. 64, fig. 7 (1896).—St. Paul in Mitteil. Deutsch. Dendr. Ges. VII. 1, t. (1898).—Schneider, Ill. Handb. Laubholzk. II. 472, figs. 314 c-d, 316 a-b (1909).—Hemsley in Bot. Mag. CXXXVI. t. 8304 (1910).—Nakai in Jour. Coll. Sci. Tokyo, XXXI. 75 (Fl. Kor. II.) (1911); Fl. Sylv. Kor. pt. VIII. 35, t. 10 (1919).—Bean, Trees & Shrubs Brit. Isl. II. 353 (1914).—Rehder in Bailey, Stand. Cycl. Hort. V. 2939, fig. 3382 (1916).

Rhododendron dauricum Maximowicz in Mém. Acad. Sci. Sav. Etr. St. Pétersb. IX. 189 (Prim. Fl. Amur.) (1859), in part.

Rhododendron Taquetii Léveillé in Fedde, Rep. Nov. Spec. XII. 101 (1913).

Rhododendron mucronulatum var. *Taquetii* Nakai, Rep. Veget. Quelpaert, 71 (1914), name only.

This variety may be regarded as the southeastern form of the type being common from the Amur region southward. It occurs in Hokkaido where it is rare and finds the western limits of its range in the Chinese province of Chihli.

It is well-distinguished by its larger, less coriaceous leaves which are sometimes 7 cm. long and 4 cm. wide and usually pale on the underside, with crenate-serrate margins. The flowers are larger being often 4 cm. across, of a more pleasing shade of color and sometimes the lobes are not so deeply cleft and in consequence the flower is less flattened and more bell-shaped. The fruit, too, is usually stouter and about 1.5 cm. long. The flowers open in the Arnold Arboretum in April and early May and are remarkably resistant to frost. The variety is in many ways a superior garden plant to the type, but unfortunately, as Maximowicz points out, there are intermediate forms and I do not see how it can be maintained as a species. It is especially abundant in Korea from the mountains of the extreme north to Quelpaert. It is a common undergrowth in the open Larch-forests on the volcanic soils of north Korea where it is often 10 ft. tall. Its leaves are pleasantly fragrant when crushed or dried like those of the type and the autumn tints are similar. In Korea it is one of the first shrubs to open its flowers in the Spring and being everywhere abundant—in open rocky country, mountain slopes, cliffs and woodlands—is a prominent feature of the vegetation.

This useful plant was discovered on Po-hua-shan, a mountain west of Peking, by Dr. P. Y. Kirilow, about 1835 and introduced into cultivation by Dr. Bretschneider who sent seeds from the type locality to the Arnold Arboretum in 1882. It flowered for the first time in the spring of 1888, in the garden of Professor Sargent at Home Lea, Brookline. Each season since it has never failed to cover itself with flowers in the spring and a cheerful mass of tinted leaves in the autumn. The leaves are entirely deciduous; and it is a first-rate garden plant.

Rhododendron dauricum var. **ciliatum** Wilson, n. comb.

Rhododendron mucronulatum var. *ciliatum* Nakai in Tokyo Bot. Mag. XXXI. 241 (1917); Fl. Sylv. Kor. pt. VIII. 37, t. 11 (1919).

This variety is distinguished by its ciliate leaves and petioles. A few appressed, strigose hairs occur on the upper surface of the leaf; the flowers in size are similar to those of the var. *mucronulatum* Maxim. The cilation makes the typical form quite distinct but it varies in quantity and on some plants is reduced to a few hairs on the petiole.

Nakai, who founded the variety, gives central and southern Korea including the islands of Quelpaert, Tsushima Island, western Hondo and Kyushu as the range of distribution of this variety. I have seen no material from Japan, but I am familiar with it in Korea and a specimen from the hills round Chefoo in China is intermediate in character. On the Diamond Mountains it is particularly common and from there I sent seeds to the Arnold Arboretum in 1917. Plants raised from these seeds flowered for the first time in 1920 under glass. The plant has proved perfectly hardy in the Arnold Arboretum and its garden value would appear to be the same as the var. *mucronulatum* Maxim.

A variety with white flowers is

Rhododendron dauricum var. **album** De Candolle Prodr. VII. 725 (1839).

Rhododendron dahuricum β. *albiflorum* Turczaninow in Bull. Soc. Nat. Mosc. XXI. pt. 2, 501 (Fl. Baical. Dahur.) (1848).
Rhododendron mucronulatum var. *albiflorum* Nakai in Jour. Coll. Sci. Tokyo XXXI. 76 (Fl. Kor. II.) (1911); Fl. Sylv. Kor. pt. VIII. 37 (1919).

This albino form was discovered by N. Turczaninow in woods near the Angara River in central Siberia sometime between 1828 and 1836. Nakai quite recently found it in Korea. I have not heard of its appearance in our gardens.

Of the several hybrids of which *R. dauricum* Linn. and its varieties are part parents the first I find record of is

× **Rhododendron aprilis** Lindley in Bot. Reg. XXIX. t. 62 (1843).

This was raised by Dean Herbert by impregnating *R. ponticum* Linn. with pollen from *R. dauricum* var. *sempervirens* Sims. The figure shows an evergreen Rhododendron bearing a compact truss of pale pink flowers with yellow honey-guides on the dorsal segments.

A popular hybrid is

× **Rhododendron praecox** Carrière in Rev. Hort. 1868; 211, t. (= *R. ciliatum* Hook. f. × *R. dauricum* Linn.).—Gard. Chron. n. s. IX. 335 (1878); XVII. 295, fig. 40 (1882).—W. in Garden, XXXVIII. 32, t. 761 (1890).—W. W. in Gard. Chron. ser. 3, XII. 762, fig. 124 (1892).—Dallimore in Garden, LIX. 277, fig. (1901).—Garden, LXI. 428, fig. (1902).—W. A. Watts in Garden, LXXI. 151, fig. (1907).—Bean, Trees & Shrubs Brit. Isl. II. 350 (1914).—Rehder in Bailey, Stand. Cycl. Hort. v. 2938 (1916).

This well-known hybrid is characterised by its broad, funnel-form rose-purple to lilac flowers with corollas about 3.5 cm. across, by its ovate, ciliate calyx-lobes and by its few-flowered clusters. The leaves are persistent, from 2.5–5 cm. long, more or less oval, sparingly ciliate, with rusty-brown lepidote glands on the underside. It is a much more beautiful shrub in flower than *R. dauricum* Linn. but is less hardy. This is to be expected from the influence of the Himalayan *R. ciliatum* Hook. f. In the Arnold Arboretum we can keep it alive but the foliage and flowers are usually injured every year.

This hybrid was raised by Mr. Isaac Davies of Ormskirk Nurseries, Wavertree, near Liverpool and was exhibited before the Royal Horticultural Society in 1861, as told in the Gardeners' Chronicle for 1878.

There are several forms of *R. praecox* in cultivation including f. *grandiflorum* Cripps, with larger leaves and flowers, raised at Tunbridge Wells by Messrs. Cripps, and the f. *rubrum* Hort. so beautifully figured in the Garden, XXXVIII. 32, t. 761 (1890).

A hybrid of the second generation is

× **Rhododendron praecox** var. "Early Gem" *Rhododendron* "Early Gem" Gard. Chron. n. s. IX. 335, fig. 57 [1878] which is *R. praecox* × *R. dauricum*. This has foliage like that of *R. dauricum* and an inflorescence like × *R. praecox* but with larger flowers. It was raised at Coombe Wood nurseries by Messrs. Veitch and is figured in the Gardeners' Chronicle, 1878. In the Arnold Arboretum its hardiness is not greater than that of *R. praecox*.

SUBGEN. II. **AZALEASTRUM** PLANCH.

Rhododendron subgen. **Azaleastrum** Planchon in Rev. Hort. 1854, 43.—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 15 (Rhod. As. Or.) (1870).—Rehder in Wilson & Rehder, Monog. Azal. 109, in text (1921).

Azaleastrum Rydberg in Mem. New York Bot. Gard. I. 297 (1900), as a genus.

Represented by ..... 9. *R. semibarbatum*

Rhododendron semibarbatum Maximowicz in Bull. Acad. Sci. St. Pétersb. sér. 3, XV. 230 (Mél. Biol. VII. 338) (1870); in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 45 (Rhod. As. Or.) (1870).—Regel in Gartenfl. XXIV. 292, t. 666 (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 293 (1875).—Matsumura, Ind. Pl. Jap. II. pt. 2, 464 (1912).—Hutchinson in Millais, Rhodod. 240 (1917).

Azalea semibarbata Kuntze, Rev. Gen. II. 387 (1891).
Azaleastrum semibarbatum Makino in Tokyo Bot. Mag. XXVIII. 338 (1914).
Mumeazalea semibarbata Makino l. c., as a synonym.

Shrub 0.3–2 m. tall, branches twiggy, ascending and spreading, pubescent and with long straight gland-tipped hairs. Leaves deciduous, scattered

on the free shoots, crowded on others, petiolate, subcoriaceous, oval to lanceolate-ovate, 1–5 cm. long, 0.5–2.5 cm. wide, rounded or obtuse, sometimes truncate and slightly emarginate, apiculate at apex, rounded or narrowed at base, crenate-serrate, often ciliolate, dark green above, pale below, pubescent on the midrib on both surfaces; petiole slender, 4–12 mm. long, pubescent, often bearded with long, gland-tipped hairs. Flowers opening after the leafy-shoots have developed, solitary from axillary clustered buds, subtended by persistent paleaceous bud-scales, white spotted with red, about 2 cm. across; pedicels glandular; calyx a disc with 5 minute teeth, densely glandular and ciliolate; corolla sub-rotate, with 5 more or less oval lobes spreading from a short tube; stamens 5, exserted, unequal, 3 long, 2 short, divergent, filaments densely villose in basal half; pistil shorter than stamens, ovary densely stipitately glandular, style glabrous, persistent, stigma capitate. Fruit subglobose, about 4 mm. long, shining, brownish black, densely stipitately glandular; seeds wingless, obovoid, very dark brown.

Habitat. Japan, mountains of Kyushu, Shikoku and Hondo from Mt. Kirishima northward to Mt. Iwate.

This is an odd-looking, very glandular plant with small, concealed flowers produced singly from a lateral bud. At the end of the shoot a cluster of buds are formed, the central one develops into a leafy shoot and the lateral ones, of which there may be 5 or 6, each produces a solitary flower; the whole forms a false cluster, the flower-stalks are hidden among the chaffy bud-scales. The flowers are small and hidden beneath the leaves. The fruit is very sticky and being small gathering seed is a tedious business. The autumn tints of the leaves range from yellow and orange to crimson. This species is wide-spread in Japan where I have gathered it from Kirishima in the south to Matsushima in northern Hondo. In the woods bordering the Otake-gawa in Shinano province it is abundant. It forms a rather narrow bush and may be from one to six feet high. It was discovered by Maximowicz's collector, Tschonoski, who sent seeds to the Botanic Garden, Petrograd, where it flowered in 1870 in a greenhouse and was figured by Regel in the Gartenflora. In 1914, I collected seed and plants were raised and distributed by the Arnold Arboretum. This species can only recommend itself to the collector for its flowers have little in the way of beauty. In the Arnold Arboretum it has not proved hardy though I think it should be.

Subgen. III. **THERORHODION** Rehd.

Rhododendron subgen. **Therorhodion** Rehder in Wilson & Rehder, Monog. Azal. 109, in text (1921), as a subgenus.

Rhododendron sect. *Therorhodion* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. 15 (Rhod. As. Or.) (1870).
Therorhodion Small in North Am. Fl. xxix. pt. 1, 45 (1914), as a genus.

KEY TO THE SPECIES

Leaves petiolate, obovate to spathulate, an inch or more long, venation prominent; flowers an inch or more in diameter.....10. *R. kamtschaticum.*
Leaves sessile, lanceolate to oblanceolate, less than an inch long, venation not prominent; flowers less than an inch in diameter.....11. *R. Redowskianum.*

Rhododendron kamtschaticum Pallas, Fl. Ross. I. 48, t. 33 (1784).—Chamisso & Schlechtendal in Linnaea, I. 513 (1826).—Loudon, Arb. Brit. II. 1139, fig. 9, 40 (1838).—De Candolle Prodr. VII. 726 (1839).—Hooker, Fl. Bor. Am. II. 43 (1839).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 47 (Rhod. As. Or.) (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 293 (1875).—Regel in Gartenfl. XXXVI 593, t. 1200 (1887).—Hutchinson in Bot. Mag. CXXXIV. t. 8210 (1908).—Schneider, Ill. Handb. Laubholzk. II. 507, figs. 331 p–r, 333–e (1909).—Wocke in Gartenwelt, XIII. 554, fig. (1909).—Matsumura, Ind. Pl. Jap. II. pt. 2, 462 (1912).—Bean, Trees & Shrubs Brit. Isl. II. 363 (1914).—Miyabe & Miyake, Fl. Sachal. 310, no. 386 (1915).—Millais, Rhodod. 198 (1917).

Rhodothamnus kamtchaticus Lindley in Lindley & Paxton, Flow. Gard. I. 113, t. 22 (1850).—Lemaire in Jard. Fleur. I. t. 53 (1851).
Therorhodion camtschaticum Small in North Am. Fl. XXIX. pt. 1, 45 (1914).

A much-branched shrub, 15–30 cm. high, current season's shoots sparsely glandularly pilose, shining brown. Leaves deciduous, often crowded, short-petioled, membraneous, obovate to spathulate, 2.5–4 cm. long, 1–2.5 cm. wide, rounded and mucronate at apex, narrowed at base into the winged petiole, glandular-ciliate, reticulate above, venation prominent below, with few strigose hairs on principal veins. Flowers solitary[1] or racemosely 2–3 rose-purple, bowl-shape 2.5–3.5 cm. across; pedicels erect, 1.5–3.5 cm. long, glandularly pilose; bracts foliaceous; calyx green, foliaceous, persistent, deeply 5-lobed, lobes oblong-elliptic, 1–1.5 cm. long 0.4–0.6 cm. wide, obtuse, mucronate, glandular-ciliate; corolla deeply 5-lobed, lobes spreading from a short tube 3–6 mm. long, elliptic to ovate-elliptic, 1.5–2.5 cm. long, 1–1.5 cm. wide, villose at base within; stamens 10, unequal, filaments color of corolla, villose near base, anthers blackish; pistil longer than stamens, ovary conic, clothed with gray villous hairs, style curved, stigma slightly capitate. Fruit ovoid, 1–1.2 cm. long, glabrescent, enclosed within persistent calyx; seeds wingless, minute, obovoid, shining yellow-brown.

[1] It is frequently stated that the flowers of *R. kamtschaticum* Pall. and its relative *R. Redowskianum* Maxim. are borne on "special leafy shoots" or are "terminal on leafy shoots." The flowers certainly develop from a "terminal" and "special" bud, as they do in the sections Leiorhodium and Lepipherum of the subgenus Eurhododendron but I would regard the "leafy shoot" as a bracteate peduncle which may bear a solitary flower or it may develop into a few-flowered raceme by the appearance of from one to three additional pedicels from the axils of the foliaceous bracts. That is this peduncle is the homologue of the rhachis in the racemose-umbellate flowered species, the difference being that it is more elongated, the pedicel often adnate for some distance giving the false appearance of dichotomous branching and that the bracts and bracteoles are foliaceous instead of membranous. This peduncle or rhachis does not develop any buds after the ripening of the fruit and is deciduous.

Habitat. Japan, northern Hondo and Hokkaido; Kuriles, Saghalien, Kamtschatka, Aleutian Islands to Alaska and southward to Banks Island, British Columbia.

This pretty plant of boreal regions strongly suggests a Cistus and is very unlike an ordinary Rhododendron. It is widely distributed through regions just south of the arctic circle and has the distinction of being the only species of Rhododendron common to Asia and North America. Millais says it is also abundant in west Greenland, but surely he is mistaken. I can find no other record of this plant growing in Greenland and conjecture that Millais has confused it with *R. lapponicum* Wahlenb. which is a common plant there. In Asia it has the southern limits of its distribution on the mountain peaks of northern Hondo where, however, it is very rare. It is partial to sphagnum bogs and marshy places and on the mountains is found growing beneath taller shrubs in regions where the annual precipitation is considerable and uniform.

According to Loudon it was introduced into English gardens in 1802 (Bean says 1799) but it has proved a difficult subject to cultivate. It is quite hardy in Massachusetts and does well in the Proctor Arboretum, Topsfield.

There is said to be a white-flowered variety

Rhododendron kamtschaticum var. **albiflorum** Koidzumi in Tokyo Bot. Mag. xxxi. 34 (1917).

The author gives Mt. Nutakkamshipe in Hokkaido as the locality for this albino.

Rhododendron Redowskianum Maximowicz in Mém. Acad. Sci. Sav. Etr. St. Pétersb. ix. 189 (Prim. Fl. Amur.) (1859); in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 48, t. 2, figs. 21–25 (Rhod. As. Or.) (1870).—Fr. Schmidt in Mém. Acad. Sci. St. Pétersb. sér. 7, xii. no. 2, 55 (Reis. im Amur-l.) (1868).—Komarov in Act. Hort. Petrop. xxv. 208 (Fl. Mandsh. iii.) (1907).—Schneider, Ill. Hand. Laubholzk. ii. 508, fig. 333 f–h (1909).—Millais, Rhodod. 234 (1917).—Nakai, Fl. Sylv. Kor. pt. viii. 38, t. 12 (1919).

Rhododendron Chamaecistus Chamisso & Schlechtendal in Linnaea, i. 513 (1826), not Linnaeus.—Ledebour, Fl. Ross. ii. 921 (1846).

A much-branched shrub, 5–15 cm. high, branches spreading on the ground, angular, clothed with adpressed leaf-bases, pubescent between pulvini. Leaves deciduous, clustered, membraneous, sessile, oblanceolate to lanceolate, 5–10 mm. long, 3–5 mm. wide, acute or rounded at apex, narrow at base, crenate-serrate, glandularly ciliate, veins slightly impressed above, prominent below. Flowers 1–3, rose-purple, about 2.5 cm. across; peduncle and pedicel pubescent and glandular, pedicels 8–12 mm. long; bracts leaf-like; calyx foliaceous, deeply 5-cleft, persistent, lobes oblong-lanceolate, 5–6 mm. long, 2–3 mm. wide, acute, pubescent, glandularly

ciliate; corolla deeply 5-cleft, lobes spreading from a short tube, erose; stamens 10, unequal, filaments slender, densely villose at base, anthers relatively large, dark purple; pistil shorter than stamens, ovary densely villose, style relatively stout, curved, persistent, pilose at base, stigma capitate. Fruit ovoid, 5–8 mm. long, pubescent, enclosed within the colored, persistent calyx, topped with style; seeds minute, wingless.

Habitat. Northeastern Asia, alpine regions from the Stanovoi Mountains eastward; Korea, higher mountains of the north.

This tiny alpine plant is in many ways a diminutive of its close relative, *R. kamtschaticum* Pall. It appears to be confined to continental northeastern Asia and finds its southern limit of distribution on Paktu-san and a few other of the high mountains of Korea. It was discovered early in the nineteenth century on the Stanovoi Mountains by a Russian traveller, Redowsky, but was confused with the European *R. Chamaecistus* Linn. now known as *Rhodothamnus Chamaecistus* Reichb. I did not see it growing in Korea and do not know that it has been introduced into gardens.

INCUNABULA IN THE LIBRARY OF THE ARNOLD ARBORETUM

ETHELYN M. TUCKER

To the bibliophile perhaps no class of books is so interesting as the incunabula, important not only from the point of view of the history of printing but also for their artistic and scientific value. The typographical interest of the 15th century books predominated for so many years that their scientific interest was for a time almost lost sight of, and fortunate is the scientific library which now possesses a few of these treasures, bearing on its particular subject.

In 1905 the Arnold Arboretum Library received by gift from Mrs. J. Montgomery Sears its first book printed before the year 1500. It has gradually acquired others, largely by gift from Mrs. Sears, and by her recent gift of three important books the collection has received a notable addition. These recent gifts are her copy of the HERBARIUM of APULEIUS PLATONICUS or BARBARUS, probably the only copy in the United States, and two works of Columella, of which no other copies have been reported in this country, namely:

Jo. Moderati Columelle ortuli commentariũ || incipit feliciter. [Romae, Steph Plannck.] ff. 10. Hain 5495; *and*

Lucii Junii Moderati Columelle de Cultu || hortorum Liber xi. Quem. Pub. Virgilius || M. ī. Georgicis Posteris edendum dimissit || Ad eiusdẽ Carmen Prefatio. ff. 10. Hain 5498.

For the following note on the HERBARIUM of APULEIUS I have drawn from Mrs. Arber's "Herbals," and Dr. Arnold C. Kleb's "Herbals of the

fifteenth century." Little is known of the author, who lived in the fourth or fifth century and seems to have been neither Roman nor Greek, hence his epithet BARBARUS. "There is not the slightest evidence that he had anything in common with Lucius Apuleius of Madaura in Numidia (born about 125 A.D.)" with whom, however, he is sometimes confused. The HERBARIUM, based on classical writings, especially those of Dioscorides and Pliny, and of which many manuscripts were in circulation from the sixth or seventh century on, is among the earliest to which the term "Herbal" is generally applied, and is perhaps the first by which any kind of systematic knowledge of medicinal plants was brought into Britain. "Four early printed editions of the Herbal of APULEIUS PLATONICUS are known, all of which appear to have been based on different manuscripts. The earliest was published in Rome late in the fifteenth century from a manuscript discovered by Joh. Philippus de Lignamine, physician to Pope Sixtus IV. The passage of the earliest printed books through the press was naturally extremely slow giving the printer opportunity to make alterations so that books actually belonging to the same edition show variations." Thus, of the extant edition of APULEIUS' HERBARIUM two variants seem to exist which Dr. Klebs designates as *a* and *b*.

a Dedicatory epistle to F. de Gonzaga Cardina || Mantuanum . . .

b Dedicatory epistle to D. Iuliano de Ru || vere Ro. Se. Episcopo Cardinali || Sabinensi

There is considerable difference in the dates attributed to this latter variant. Banks states "Editio non est posterior anno 1471, quo Cardinalis de Ruvere Pontifex electus fuit Maximus." This is probably due to Banks' confusion of Francesco della Rovere (Pope Sixtus IV) with Julius della Rovere to whom this book is dedicated. Pritzel evidently copied Banks. The British Museum gives 1480 as the date but Dr. Klebs in the following note places it at 1483 or 1484.

"Lignamine had a press in his house, but probably never printed himself. In his somewhat loquacious dedicatory epistles he usually gives interesting information. Since Cardinal Gonzaga died in October, 1483, it is very likely that the dedication to the nephew of the pope, Cardinal Giulio della Rovere, was substituted during the printing. Therefore variant *b* is the later and the date of printing 1483 or 1484 can be fixed with fair accuracy. Mrs. Sears' copy must be variant *b*, because Lignamine's epistle ends on 4a, blank in both Hain's and the British Museum copies." Hain 1322 in his citation of what Dr. Klebs is pleased to call variant *a*, says, "Impr. est a 1484. Extant exempl. c. dedicatoria ad Julium della Rovere," (a fact which Dr. Klebs seems to have overlooked). In which case variant *b*, the later variant, could not be 1483. Furthermore Dr. Klebs' conclusion that Mrs. Sears' copy is variant *b* is not well grounded, since its first leaf is folio 7a, at the head of which within a wreath of leaves is "Incipit || Herbarium Apulei Plato || nici ad Mar || cum Agrip || pam." Three leaves of the dedicatory epistle are altogether wanting, ff. 4a (upon

which he bases his conclusion)—6b are loose, of a different paper and smaller page, seeming to prove that they were taken from some other copy, and ff. 6a–6b are plainly manuscript (a few leaves at the end are also wanting). Hain's date of 1484 seems the safest for us to accept.

COLUMELLA was born probably at Cadiz, (Gades) and wrote in the first half of the first century. He was the author of the most important Latin work on ancient agriculture, "De re rustica" in twelve books of which "De cultu hortorum" forming the tenth, not the eleventh as given in the title, is in verse. That "Liber xi," is a typographical error is evident from comparison with copies of "De re rustica" in the Arboretum library.

Both the "Ortuli" and the "De cultu hortorum," are extremely rare. The latter is, according to Brunet, "Editio princeps;" it is by an unknown Italian printer "D. S." (by whom it is signed) and is not known in any of the French libraries.

Other incunabula in the library are given in the following list, each entry giving reference to Hain's "Repertorium bibliographicum," with frequent reference to Dr. Arnold Klebs' "Incunabula lists, 1." To Mr. George P. Winship, librarian of the Widener Collection at Harvard University, I am also indebted for help in identifying some of our copies.

BARBARUS, Hermolaus. Castigationes Plinij Hermolai Barbari. [Rome. 1492–93.] G.L.

Hain 2420.

By an unknown or unidentified printer. In modern binding.

Gift of Mrs. Sears.

BARTHOLOMAEUS ANGLICUS (sometimes called DE GLANVILLA). De proprietatibus rerum. [Lyons. Impressus per Nicolaus pistoris de Benssheym et Marcum reinhardi de Argentina socios. 1480 die vero Julij 29.] G.L.

Hain 2500.

In modern binding, leather back.

Gift of Mrs. Sears.

———— Liber de proprietatib[9] rerum. [Impressus Argentine. 1491.] G.L.

Hain 2509.

In old vellum.

Gift of Mrs. Sears.

CRESCENTIIS, Petrus de. [Opus ruralium commodorum. 1490?] G.L.

Hain 5826.

Petri de crescentiis Ciuis Bo || nonieñ. in commodu ruralium || cum figuris libri duodecim. (B. M. Printed at Speier by Peter Drach.)

Bound in oak boards, one half covered with leather beautifully stamped, and with original clasps. The date is undetermined, probably 1490. On the fly-leaf is written in an ancient German script "Oldest printed work on agriculture, probably 1471.

The 40th of all printed books." This refers evidently to the earliest edition which has place, printer and date, and not to the Arboretum copy.

Gift of Mrs. Sears in 1905, first fifteenth century book received by the Library.

HERBOLARIUM seu de virtutibus herbarum. [Impressum Vincĕciæ, per Magistrum Leonar || dum de Basilea & Guilielmum de papia Socios. 1491, die 27 meñ. Octob.]

Hain 8451.

Bound in brown morocco, with blind tooling. Numerous early MS notes in margin, and English translation of preface in MS on fly leaf. Eight of the woodcuts are colored by hand, apparently by an early owner.

Gift of Mrs. Sears.

ORTUS sanitatis. Klebs [Strasburg, Prüss. c. 1497.] Copinger [1490.] G.L.

Hain 8941.

In modern vellum, lettered "Editio princeps." Both sides of the first folio are covered with a transparent mending paper. Below the title is written in faded ink, "Anno Domini MDccccIxxxxvii. xii Kalend. Novembris." The remaining MS is undecipherable, it may be the name of the owner and the writer of the date. The initial letters are red or blue.

Gift of Mrs. Sears.

———— Klebs [Strasburg, Prüss. c. 1496.] Copinger [1487.] G.L.

Hain 8942.

Bound in red morocco, beautifully tooled. Initial letters red or blue.

Gift of Mrs. Sears.

———— [Mainz, Meydenbach. 1491, 23 Jun.]

Hain 8944.

In oak boards, half covered with old vellum, blind tooled, parts of clasps. Above the title is written "Ex Bibliotheca Windhogiana."

Gift of Mrs. Bayard Thayer.

HERBARIUS zu teutsch. [Mainz, Schoeffer. 1485, 28 Mar.] G.L.

Hain 8948.

This Herbarius is the original of the whole Ortus family.

Bound in a sheet of vellum manuscript. A fuller description is given in this *Journal*, vol. iii, no. 1.

Gift of Mrs. Sears.

MACER FLORIDUS. De viribus herba⁴ Famosissimus medicus et medico⁴ Speculum.

Hain 10417.

By an unidentified Paris press, before 1500.

Bound in brown morocco with blind tooling, MS notes in faded ink. Of this copy Dr. Klebs says it "represents an edition which so far as I know has never been described."

Gift of Mrs. Sears.

OPERA AGRICOLATIONUM (Scriptores rei rusticae). [Regii, Bruschus. 1482, 9 Junii.]

Hain 14565.

Bound in old vellum. From the library of George Dunn.

———— [Impressa Regii impẽsis Diõysii Bertochi Regien. imperante. 1496, 13 Kalen Octobris.]

Hain 14569.

Gift of Mrs. Sears.

MATTHAEUS SYLVATICUS. Liber pandectarum medicine. [Argentorati? c. 1470.] G.L.

Hain 15192.

In boards covered with brown leather, blind tooled and with marks of old clasps. From the library of George Dunn.

Gift of Mrs. Sears.

———— [Venetiis, impẽdio Johanis Colonie Agrippinesis Johanisqz mãthen ghertzen socios⁴. 1480, sexto idus octobris.]

Hain 15198.

In old vellum, blind tooled, with old clasps and swivel for chain.

Gift of Mrs. Sears.

THEOPHRASTUS ERESIOS. De historia plantarum lib. ix et decimi principium duntaxat, eiusdem de causis plantarum lib. v [vi. 148–?]

Bound in brown stamped leather. Date quite undetermined, may belong to early part of sixteenth century.

Gift of Mrs. Sears.

VINCENTIUS BELLOVACENSIS. Speculum naturale. 2 vol. [Strassburg, Adolf Rusch? 1479?] G.L.

Two illuminated letters, initial letters red.

Gift of Mrs. Sears.

———— 3 vol. [Basel? 1486?] G. L.

Bound in vellum.

Gift of Mrs. Sears.

Neither of the two preceding titles has been identified.

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NORTHERN TREES IN SOUTHERN LANDS

ERNEST H. WILSON

INTRODUCTION

SINCE the settling of the white man in the southern hemisphere many northern trees have been introduced there, some for their economic value and others for aesthetic purposes. Now that the world-wide shortage and consequent high price of timber has called forestry and especially afforestation into active being the value of exotic trees for practical forestry purposes is being universally appraised. Each country is requesting quick growing trees yielding useful timber. Haste is the order of the day and it is remarkable that so few southern countries where forestry has been inaugurated seem to find indigenous trees of sufficiently rapid growth. And so the exotic is in request. During my recent tour through Australasia and South Africa I found much to interest me in the behavior of our northern trees in these southern lands and it has been thought that these observations may be worth recording.

That varieties of such northern fruit trees as the Apple, Pear, Peach, Nectarine, Japanese Plum, Orange and Lemon thrive in parts of Australasia and South Africa is common knowledge. Less is known about the behavior of the ordinary northern trees planted either for ornamental or forestry purposes in the southern lands and yet several species of these trees flourish amazingly there and are already proving an immense boon to the people.

In popular language trees are commonly divided into the two classes of Hardwood and Softwood. All dicotyledonous trees are classed as Hardwood and all the gymnospermous trees as Softwood. That the terms are misleading is obvious, for the wood of many Dicotyledons is so soft as to be utterly useless as timber. However, in general the wood of the Gymnosperms is straighter of grain and more easily worked than that of Dicotyledons. In the northern hemisphere the Conifers yield nearly all the softwoods but in the southern hemisphere there is a great scarcity of this kind of timber and such as there is is yielded chiefly by the Taxads. No species of northern Conifers or Taxads is indigenous in the southern hemisphere and of these families five genera only have representatives

both north and south of the equator. Of the Conifers the genus Libocedrus is represented in California by *Libocedrus decurrens* Torr., in Formosa and southern China by *L. macrolepis* Benth. & Hook. f. and by six other species south of the equator of which two grow in South America, two in New Zealand, one in New Caledonia and one in New Guinea. One species (*Juniperus procera* Hochst.) of the characteristic northern genus Juniperus just crosses to the south of the equator on the highlands of Kenya Colony in central Africa. Of the tropical genus Agathis one species (*Agathis alba* Foxw.) is found in Malaya and the Philippines while the others grow south of the equator, one of these (*A. australis* Steud.) being the famous Kauri Pine indigenous in northern New Zealand. Of Taxads several species of the cosmopolitan genus Podocarpus are found north of the equator and two of them (*Podocarpus macrophylla* D. Don and *P. nagi* Zoll. & Moritzi) occur as far north as southern Japan. The genus Dacrydium belongs principally to the southern hemisphere but is represented north of the equator by the Malayan species *Dacrydium elatum* Wall. and *D. Beccarii* Parl.

FOREST WEALTH AND FOREST PROBLEMS

Before proceeding further it is advisable to say a few words about the forest wealth and forestry problems of these southern lands. Africa south of the Zambesi River is high level country except a narrow broken coastal fringe. On these highlands forests, as we understand the term, do not exist. The trees found there are low-growing with short boles and occur in open park-like formations. All are hardwoods of little value. In the broken coastal fringe in parts of Natal, Zululand and the Cape Province there are belts of dense forests where grow a variety of useful timber trees. Among them are three species of Podocarpus (*Podocarpus latifolia* R. Br., *P. falcata* R. Br., and *P. Henkelii* Stapf which furnish softwoods of great value. Unfortunately these and the best of the hardwoods occur scattered through the forests and their exploitation is both wasteful and expensive. The best and most accessible of these trees have been removed. Apart from the three species of Podocarpus referred to the only other softwood trees are various species of Widdringtonia of which few grow to any size but their wood is imperishable in the ground. To meet the increasing requirements of a growing population South Africa needs trees for timber and also for shade. The imperative necessity of tree planting is now being recognized. It has been found that the indigenous trees are of very slow growth compared with certain exotic species and forestry in South Africa simply means tree-planting and the conservative exploitation of such forest remnants that exist. As will be shown later soil and climate in many parts of South Africa seem favorable to tree growth and a number of exotics flourish in a remarkable manner.

Australia is a continent in every respect and an arid central zone divides it naturally into western and eastern halves. Much of West Australia

is dry and covered with thorny scrub. The north is scarcely known and not at all so far as its forest wealth is concerned. The southwestern corner only of the vast region of Western Australia—a region one-third the size of the United States—is fairly well forested with Eucalyptus chief of which are Jarrah and Karri (*Eucalyptus marginata* Smith and *E. diversicolor* F. V. Muell.). There are plenty of hardwoods but no softwoods. Callitris and Actinostrobus, the only indigenous conifers, are small and commercially valueless as a source of merchantable timber. In eastern Australia climatic conditions are more varied but except in Queensland softwoods are everywhere needed. South Australia is poorly forested. Victoria and New South Wales are rich in valuable species of Eucalyptus and in the dry interior parts of the last-named state certain species of Callitris grow more or less gregariously and furnish timber very serviceable for fencing and similar purposes. Queensland, much of which is north of the tropic of Capricorn, has near the coast fine mixed forests of trees yielding timber useful for all purposes. Less settled than the other eastern states the forests of Queensland have suffered comparatively slightly and now if rightly used will be found one of her greatest assets. There are hardwoods in quantity and what is more important a considerable supply of softwoods in Agathis and Araucarias. In Queensland the chief problems of forestry center in the natural regeneration of indigenous trees and the judicious exploitation of the forest wealth. Exotic trees, except perhaps some of the more tropical species of Pinus, are not likely to be of importance in afforestation work. The other four states, New South Wales, Victoria, South Australia and Western Australia, are not so fortunate. For supplies of softwood timber they will have to rely upon exotic trees or continue to import it from other countries. It is true that various species of Callitris, a genus related to the northern Cupressus, are indigenous in each state but as a source of softwood timber they are negligible except perhaps in the dryer parts of New South Wales. Eucalyptus is as robust as it is polymorphic and furnishes timber suitable for all purposes for which hardwoods are used. It regenerates freely especially after fires though often inferior species tend to become dominant. The ideal treatment of Eucalyptus forests would be clean felling and logging, followed by burning of all debris then rigid fire protection until thinning becomes necessary after which light burnings may be useful in keeping down grass and miscellaneous scrub growth. Less economical but more practical is the felling and removal of all mature and overmature trees and efficient fire protection for a second crop of trees. The real problems of forestry in these four states is concerned with the discovery of exotic trees that will provide softwood cheaply and in sufficient quantity for their needs. As will be shown later considerable progress has been made and certain species of Pinus especially seem to promise complete success. Tree planting will be the important task of forestry in these states and much of the land now clothed with certain species of Eucalyptus of scrubby growth and

little economic value will ultimately be planted with Pines and other exotic conifers.

Tasmania will have to follow on the same lines though once this little state was well off in both hard and softwoods. Her Eucalyptus though few in species yield timber of excellent quality and the Huon (*Dacrydium Franklinii* Hook. f.), King William and Red Pines (*Athrotaxis cupressoides* D. Don, *A. selaginoides* D. Don and *A. laxifolia* Hook. f.) furnish most excellent softwoods but commercially speaking these softwoods have nearly vanished and since the trees regenerate badly and grow very slowly their is little hope that they can ever again become important as a source of timber. This exotic conifers must supply. The Eucalpytus are still plentiful and Blackwood (*Acacia melanoxylon* R. Br.) is not particularly scarce, though wasteful methods of lumbering have played sad havoc with both. A few years ago Tasmania supplied the Admiralty Dock at Dover, England, with a number of piles each 100 feet long and squared 20 inches by 20 inches at each end. This is a record to be proud of and if only the people of Tasmania could be brought to a realization of the full value of their Eucalyptus this little island might again supply similar requirements. Fire protection is an urgent necessity wherever forests exist and especially is this true of the whole of Australia. Fire protection, the planting of suitable exotic conifers, and the conversion of sand-dunes, the Button-grass plains and other waste lands into productive areas by tree planting are the problems confronting the Forestry Service of Tasmania.

New Zealand, the last of the regions under review, is again different. The forests are rain-forests, the trees evergreen and Conifers and Taxads are the dominant elements. Before the country was settled by white men these forests clothed the greater part of New Zealand but forest destruction has been very great and some species of trees like the wonderful Kauri Pine (*Agathis australis* Steud.) are commercially speaking gone as a source of timber. No species of Eucalyptus is indigenous in New Zealand and her native hardwood trees in general are unimportant as a source of timber. The softwoods are not excelled by those of any other land but the supply is rapidly diminishing. The trees regenerate indifferently and their rate of growth is relatively slow assisted though it be by bacteriological root-tubercles. Conservative exploitation and protection of existing forests is essential in New Zealand. When the present remaining forests have been cut out gone forever will be the Totara (*Podocarpus totara* G. Benn.), the Matai (*P. spicata* R. Br.), the White Pine (*P. dacrydioides* A. Rich.), the Silver Pine (*Dacrydium westlandicum* T. Kirk) and the Rimu (*D. cupressinum* Soland.) which with Kauri (*Agathis australis* Steud.) are the glories of New Zealand forests. Their place will be taken by planted forests of exotic northern conifers of which Insignis and Laricio Pines and Larch are destined to be dominant features. For home-grown hardwoods New Zealand has yet to discover a suitable source of supply

for it is not at all certain that Eucalyptus will prove the solution of this problem. Other exotic hardwood trees grow so slowly that it seems doubtful if home-grown timber from this source could compete in price with that imported from other countries.

NORTHERN SOFTWOOD TREES

In Australia the most useful exotic tree from the timber point of view is undoubtedly the Insignis or Monterey Pine (*Pinus radiata* D. Don). In South Africa also it is the most valuable conifer yet introduced. Altogether, so far as the evidence goes, it rather looks as if this Pine will prove the north's greatest gift to the new forests in these parts of the world. It will surprise others no doubt as it greatly did me to find a species so rare as a wild tree and of so little value in its native land to be of such immense importance in the antipodes. The quality of all timber depends very greatly on soil and climate. In the southern hemisphere the wood of the Insignis Pine is much superior to that of the same tree growing in California, its native state. It really makes quite good deals and for rough carpentry, box-making and similar purposes it is good enough. In New Zealand I saw the interior of out-buildings which had been fitted many years before with the timber of this tree and its lasting properties were quite satisfactory.

In the lands of which I write this Pine is everywhere known as *Pinus insignis*. It does not thrive equally well in all austral countries. In South Australia and Victoria, on the Canterbury Plain of the South Island of New Zealand, round Cape Town and Grahamstown, respectively in the west and eastern parts of the Cape of Good Hope, it thrives best. There are places like Rotorua in the North Island of New Zealand and Strahan on the west coast of Tasmania where it also promises to do well. In Western Australia it grows rapidly for the first 10 years and then shows a tendency to die out. In that country it is inferior to the Cluster Pine (*P. pinaster* Ait.). In parts of New South Wales it thrives, but round Sydney, where there are plenty of good-sized trees, disease has made its appearance. In Queensland it does not grow well.

The rate of growth of this tree is phenomenal. On St. Leonard's farm, a few miles from Hanmer Springs, Canterbury, New Zealand, I saw in 1921 a grove of Insignis Pine originally planted as a broad windbreak 40 years previously. It was being felled and the trees averaged 800 board feet of timber. The usual height was about 100 feet with trunks 8 feet in girth, but some trees were as much as 115 feet tall, 11 feet in girth of trunk and yielded 1000 board feet of merchantable timber. In other parts of the Canterbury Plain, notably near Greendale, I saw other windbreaks of this tree almost, if not quite, as good as that at St. Leonard's. At Macedon, a few miles out of Melbourne in Australia there are planted woods of this Insignis Pine where the trees average 100 feet in height with fine boles. Round Ballarat, also in Victoria, it flourishes and woods

planted and owned by the City Water Board are a valuable source of revenue. In South Australia the success of this Pine is assured, indeed it has made the reputation of the Forestry Department. Seventy-three and a half acres of Insignis Pine, the oldest 36 and the youngest 33 years of age, were felled clean and yielded 4,117,914 superficial feet of lumber which sold at $2.50 per 100 superficial feet and realized over $100,000. The capital outlay per acre with compound interest at 4½ per cent included was reckoned at $320, the gross returns at $1490, leaving a net profit of $1170 per acre.

On leaving Australia it had become a settled conviction in my mind that for rate of growth in annual timber increment no planted conifer could excel Insignis Pine at Macedon and on the Canterbury Plains. It was left for Cape Town to shatter this conviction but with the same species of Pine. The Conservator of Forests, Charles R. Ross, took me to his forestry station at Tokai. There I saw trees 33 years old that were 138 feet tall and 10 feet in girth. Two stands of this Pine had been felled at 29 years of age and yielded respectively 7,972 and 7,721 cubic feet of timber per acre. During the war the Government sold about 160 acres of Insignis Pine and the sum realized was approximately $350,000. At from 12 to 15 years of age this tree is large enough to yield boxwood; at 40 years of age a fully-stocked wood of Insignis Pine on good soil is estimated to yield from 10,000 to 12,000 cubic feet of timber per acre.

At the Cape and in Australia and New Zealand the wood of the Insignis Pine is not strong or durable in contact with the soil. But it is tough, virtually free from resin and useful for fruit-boxes; it is also good wood for match-boardings, ceilings, joinery, packing-cases and in general for purposes where strength and durability are not required. In short it yields cheaply and quickly a class of timber necessary and in great demand in all these lands. The rapid growth and usefulness of this tree is now an established fact in the antipodes. That it will not thrive in all parts of this region is absolutely certain, but that it will probably be found to flourish over wider areas than so far have been experimented with is equally certain. Over great areas in Australia and only slightly lesser ones in New Zealand and South Africa, Insignis Pine will yield three crops per century of merchantable timber of a class necessary for the development of the industries of these countries. Where it is found to flourish no more useful softwood tree can be planted in these southern lands. Its natural regeneration is good and New Zealand is now the main source of seed supply.

Of little merit in its native land this Pine was introduced into England in 1831–32 by David Douglas who gave it the manuscript name of *Pinus insignis*. Soon afterward further material was received and David Don described and published it in 1835 under the name of *Pinus radiata*. It is a handsome tree with dense blackish green leaves, stout branches, a broad pyramidal outline when young but ultimately with an open round-

topped crown. In England it has proved hardy only in the most favored regions but there it is the fastest growing of all the species of Pinus. Just when and how it was introduced into Australia I have not been able to discover but no doubt the credit belongs to one of the Botanic Gardens all of which have shown noteworthy enterprise in introducing trees, shrubs and herbs. In Newman's *Catalogue of Plants in the Royal Society's Garden*, Hobart, Tasmania, published in 1857 the tree is recorded as being in cultivation there. From Australia it was carried to New Zealand. It is in southeastern Australia and New Zealand where this tree has found itself and demonstrated its great value for forest planting. Its value to South Africa seems to have been an independent discovery. A tree was growing in the Municipal Gardens at Cape Town and J. S. Lister, then Conservator of Forests, being engaged in experimenting with all sorts of exotic trees for forest planting, determined to make a small plantation of it at Tokai. This was done in 1889 and the result as already described has astonished everyone. Quite unheralded came this Californian tree to the antipodes where it is destined to become of vastly increasing value and probably the most important softwood tree for many southern lands. The success of this tree proves two things. First, the indispensable value of botanic gardens and arboreta in every country. Secondly, that a tree of little value for its timber in one country may be of enormous value in another. A third fact which this tree clearly demonstrates may be set down, namely that no one can properly appraise the value to the world of any one species of tree. Experiment alone can prove this and even then the results are conclusive only for the district and perhaps immediate neighborhood where they are carried out.

In the Cape Province of South Africa, Insignis and Pinaster Pines thrive where a winter or all the year round rainfall obtains but are liable to disease where the rainfall is a summer one. Insignis but not Pinaster thrives under the same seasonal rains in New Zealand, Tasmania and southeastern Australia and both fail in those parts of New South Wales where a summer rainfall obtains. But in Western Australia where the rainfall is a winter one Insignis does not promise to be a permanent success on sandy soils whereas Pinaster does. On good soil, however, the story will probably prove to be different.

The Landes districts of southwestern France have abundantly demonstrated the usefulness of *Pinus pinaster* Ait. so it was natural that Governments through their advisors and foresters should early introduce this Pine for planting on sandy coastal areas in the antipodes. Its greatest success in southern lands is at Cape Town. There it has found a suitable home and is thoroughly naturalized both on the better soil of the Cape Promontory and on the sandy flats which separate Table and False Bays. It grows more slowly than Insignis Pine but the rate of growth exceeds what we of the North are accustomed to consider satisfactory. Around Port Elizabeth it does well and at Grahamstown the municipal plantations

of this tree on common lands are a source of revenue. At Knysna extensive plantings of Cluster Pine have been made that give every promise of complete success. This Pine has proved its usefulness and adaptability in various parts of South Africa and there is good reason to believe that it will succeed in other parts of the coastal regions where the heat is not excessive and where the rainfall is a winter or an all the year round one. In the southwest of Western Australia the Cluster Pine has been sparingly planted and it appears that on sandy soil to be superior to Insignis Pine though at first it grows more slowly. In many places in southeastern Australia and New Zealand I saw good trees of Pinaster but nothing to indicate that it is likely to become an important source of timber in these countries. In South Africa the timber of Cluster Pine is useful for flooring, rafters, joists and in general carpentry and when treated with creosote it makes good railway ties. It is too resinous for fruit-boxes but is excellent for packing cases.

The Stone or Table Pine (*P. Pinea* L.) was long ago introduced into the Cape where it flourishes and there today may be seen splendid avenues and groves and magnificient specimen trees of this remarkable Pine. It is a feature of the landscape in and round Cape Town, where it has become naturalized. At Port Elizabeth, too, it is also a success. In Australia the Stone Pine has been planted as an ornamental tree in many places but with indifferent results. At Adelaide and elsewhere I saw fair specimen trees but an avenue of this tree in the town of Parramatta in New South Wales was a deplorable sight. Round Perth in Western Australia it is a failure. At Hobart in Tasmania there are a few good trees and I saw others in various places in New Zealand but except at Cape Town and Port Elizabeth in South Africa there is nothing to indicate that this tree will be of importance in austral lands. The same is probably true of the Aleppo Pine (*P. halepensis* Mill.) which has been planted in association with Cluster Pine in South Africa and to a greater extent in Australasia. At Adelaide in particular there are large specimens of this Pine over 80 feet tall. In many places in Australasia it grows faster and attains larger dimensions than it does in its Mediterranean home but the crown is scrawny, the foliage sparse and tufted at the ends of the branchlets and the cones long retained in great numbers are unsightly. On parts of the Canterbury Plains in southern New Zealand it grows well and reproduces itself freely.

In Western Australia the most valuable Pine is *P. canariensis* Smith but although there are plenty of handsome trees from 60 to 75 feet to be seen scattered about the older townships there have been no extensive plantations of the tree yet made. It makes a stout tap-root and is in consequence difficult to transplant. Cutting the tap-root of seedlings when young may solve this difficulty but sowing in situ is the surest method where practicable. The tree is so valuable that nothing will be left undone to surmount this problem. In and near Adelaide there are

many good specimen trees and at Kuitpo, also in South Australia, I saw a fine plantation of this Pine set out by the Forestry Department. At Ballarat in Victoria it is particularly flourishing and in the park there are specimens over 75 feet tall. At Macedon it thrives well and so it does in Hobart and Launceston in Tasmania. At Sydney it is not nearly so happy and its seedlings damp off badly. The summer rainfall is evidently not to its liking any more than it is to the Stone Pine (*P. Pinea* L.). Further inland it is all right. At Orange there are good trees and on a street in Goulburn I saw a specimen over 80 feet tall and perfectly symmetrical. In South Africa it does well at the Cape with its winter rainfall and eastward as far as the rainfall is distributed throughout the year but in Natal, Zululand and elsewhere with summer rainfall prevailing it is not a success. In New Zealand it gives little promise and indeed much of the country is too cold for it yet near Nelson I saw a few good specimens. In parts of South Africa and Australasia other than those where the rainfall is a summer one the Canary Island Pine is without doubt the most valuable exotic tree of its class that can be grown. Its growth is slower than that of Insignis Pine but in South Africa it is faster than that of Cluster Pine. The wood is of very superior quality with a fine grain, works well and is valuable for building and general constructional purposes. I have seen no old trees nor trees taller than 90 feet. These had symmetrical crowns. The leafage is dense, rather gray-green, the leaves long, relatively stout and three in a fascicle. The seedling plants are very glaucous and on the older trees and especially at or near the base of the trunk adventitious branchlets, glaucous in color are usually to be found and are a ready means of distinguishing this species from its near relative *P. longifolia* Roxb.

The Canary Island Pine is not only one of the most useful of its genus but also one of the most ornamental and South Africa and Australia should be considered fortunate in having a climate suitable for the successful growth of this fine species. Where summer rainfall prevails in South Africa the northwest Himalayan *Pinus longifolia* Roxb., the Chir Pine, is a success. At Grahamstown there is a fine plantation of this Pine and there are good specimens in the Botanic Gardens in Maritzburg. It promises to be a success in parts of the Transvaal and inland, on the hills in Natal and in the Transkei, will probably thrive. In Australia I saw very little of this Pine though it is the only species which really flourishes at Brisbane. It was interesting to find good specimens in the Botanic Garden, Hobart, where among others there is a handsome specimen 75 feet tall and 7 feet in girth of trunk. In Hobart's interesting but unfortunately neglected garden there is a particularly fine collection of Conifers including many rare species of Pinus (see Wilson in *Jour. Arn. Arb.* III. 51–55 [1921]) not usually found in cultivation and many of the trees are handsome specimens superior to the others I saw in the antipodes. In New Zealand except in the north the climate is too cold for the Chir Pine. In parts of southern Queensland not too far from the sea this Pine will

probably prove of great value and the same is true for similar areas in New South Wales and possibly Victoria where the climate is sufficiently warm and the rainfall a summer or all the year round one. The Chir and Canary Island Pines may be regarded as supplementary to one another. Temperature and soil being equally favorable the former succeeds where a summer rain prevails, the other where it is a winter one. There are places enjoying an all the year round rainfall where both grow well, but the Himalayan Pine will thrive under more tropical conditions than the species from the Canary Islands. The timber of both is equally good.

At Macedon, near Melbourne, *Pinus ponderosa* Dougl. is next to Insignis Pine the most valuable species and it is equally good round Ballarat. It grows rapidly and regenerates freely and in these districts its planting will be widely extended. Just which of the many forms it is that does so well in these districts I was unable to determine but those interested would be well advised to raise plants from their own home-grown seeds. At Orange in New South Wales this Pine does well and it is probable that this will be found true for many other districts in this state, among others the temperate regions of the Kosciusko range between Tumut and Cooma. The form known as *Benthamiana* Lemm. succeeds splendidly in Hobart but the var. *Jeffreyi* Vasey and others only do moderately well. In New Zealand several hundreds of acres of *P. ponderosa* Dougl. have been planted either as pure stands or mixed with the Laricio Pine (*P. nigra* var. *Poiretiana* Schneid., but better-known as *P. laricio* Poir.) and the results in general are satisfactory. On the Canterbury Plain and in Otago where the climate is drier than the average it does remarkably well, and gives every promise of becoming a valuable tree for forest planting. In rocky places *P. ponderosa* var. *scopulorum* Engelm. does well in several places in the South Island.

In South Africa, where the testing of the various species of Pinus is being carried out on a larger scale and in a more thorough manner than elsewhere in the antipodes, *P. ponderosa* Dougl. is being very carefully studied. For the northern Transvaal where the elevation is considerable (6000 feet and upwards) and the rainfall a summer one the varieties *arizonica* Shaw and *macrophylla* Shaw (*P. Engelmannii* Carr.) give the best promise.

The Austrian Pine (*P. nigra* Arn.) has been very extensively planted in New Zealand, both pure and mixed with other trees, but except here and there in the drier parts of the South Island it must be considered a failure. In the Rotorua conservancy it is quite worthless. The growth is slow and stunted and disease is prevalent. The Laricio Pine on the contrary flourishes and with *P. ponderosa* Dougl. ranks after Insignis Pine as the best variety for New Zealand. This Laricio or Corsican Pine has been planted in quantity in both the North and South Islands and is nearly everywhere a success though its rate of growth is only about half that of Insignis Pine. At Hobart, Laricio does only moderately well but I should

think that it would succeed in the northwestern part of Tasmania. In parts of Victoria and in southeastern New South Wales this Pine will probably thrive but elsewhere in Australia and in South Africa there is little likelihood of it being of value for forest planting.

In New Zealand *P. muricata* D. Don, the Bishop's Pine, has been planted in considerable quantity but save as a shelter or for ornamental purposes is of no value there. At Hobart, in the Botanic Garden, there is a very fine specimen of the Bishop's Pine 60 feet tall with a trunk 9 feet in girth. I was surprised to find in New Zealand magnificent trees of the rare *Pinus Torreyana* Parry and this species evidently grows to a larger size there than it does in its home in southern California. In the Public Gardens at Christchurch there are growing several specimens well over 80 feet tall and 11 feet in girth of trunk; in the old Mason garden, near Wellington, I saw even larger trees. At Rotorua the Government has a small plantation of this Pine and it is doing extremely well. The Banksian Pine (*P. Banksiana* Lamb.) has also been planted there quite freely in places but without sufficient reason. Here and there in Australasia I saw fine specimens of the Digger Pine (*P. Sabiniana* Dougl.). The best, a tree 75 feet tall and 6 feet in girth of trunk, grows in the Botanic Garden at Hobart where there are also large trees of *Pinus Montezumae* Lamb. and of the lovely *P. patula* Schlecht. & Cham. The Scots Pine (*P. sylvestris* L.) is worthless in the antipodes and none of the Pines of eastern Asia or the colder parts of eastern North America have any value there, indeed, most of them merely linger. Many of the White and Nut Pines has been tried but only the Bhotan Pine (*P. excelsa* Wall.) gives any promise of success in Australasia. However, it is possible that in southeastern Australasia. the right conditions may yet be found for *Pinus Lambertiana* Dougl. The Macedonian *P. peuce* Griseb. I did not see but it ought to be given a trial in southeastern Australia and New Zealand. At Ballarat there are splendid trees of *P. Coulteri* D. Don and I saw other good specimens at Hobart and in the South Island of New Zealand.

Naturally with such a valuable timber producing genus as Pinus and one whose seeds travel well much effort has been made in the southern hemisphere to acclimatise every species obtainable. During my travels I saw plants of almost every known Pine but in Australasia save locally for ornamental purposes none other than those mentioned have proved to be of value. I cannot help thinking, however, that in the coastal parts of New South Wales and southern Queensland such species as *P. palustris* Mill., *P. taeda* L., *P. glabra* Walt., *P. caribaea* Mor., *P. echinata* Mill. and *P. occidentalis* Swartz ought to be worth a thorough trial.

At Umshalotzu, near Eshowe in Zululand, I saw plantations of *P. palustris* Mill. and *P. taeda* L. thriving amazingly, indeed, in the hot coastal regions they were growing more rapidly than any other species. In the adjacent hot parts of Natal they will probably thrive also and so, too, will *P. echinata* Mill. In the Botanic Garden, Maritzburg, there is a

fine specimen of *P. palustris* Mill. fully 60 feet tall at 40 years of age. Not far from Maritzburg I saw stands of *P. patula* Schlecht. & Cham. doing remarkably well. The Forestry Department of South Africa has shown great enterprise in securing seeds of exotic trees likely to be of value for forest planting. By an expedition to Mexico numerous species of Pines indigenous there were introduced. The expedition was entirely successful and there are growing in South Africa today nearly every known Mexican Pine. The work was commenced some fifteen years ago and the experimental plantations are now yielding important data. It has been found that these do best on the highlands of the northern Transvaal and inland in Natal and the Eastern Province where summer rainfall obtains. In the northern Transvaal *P. leiophylla* Schlecht. & Cham., *P. Montezumae* Lamb. and *P. patula* Schlecht. & Cham. are growing best, putting on an average of 3 feet of growth annually, and with the varieties *arizonica* and *macrophylla* of *P. ponderosa* Dougl., promise to be the Pines best suited for that region. Similar results I was told have been obtained in the Transkei. Other species doing well in these same places are *P. teocote* Schlecht. & Cham., *P. Lumholtzii* Rob. & Fern., *P. Lawsonii* Roezl, *P. oocarpa* Schiede, *P. pseudostrobus* Lindl. and its var. *tenuifolia* Shaw, the variety *chihuahuana* Shaw of *P. leiophylla* and such varieties of *P. Montezumae* Lamb. as *Hartwegii* Engelm. and *Lindleyana* Loud. On the slopes of the Cedarbergen range, in the Clanwilliam division, I saw plantations of these Mexican Pines. Some like *P. Lawsonii*, *P. patula* and *P. Montezumae* were growing well but in this region of winter rainfall none promise to be of so much value as *P. radiata* and *P. canariensis*. In the northern and eastern parts of South Africa the story is different—some of these Mexican Pines are likely to prove to be the most valuable species. The experiment is one of great value and the results of much importance to all interested in these little-known species.

Douglas Spruce or Oregon Pine is one of the chief timbers imported into both Australia and South Africa so it is quite natural that in these countries there should be a strong desire to grow this tree (*Pseudotsuga taxifolia* Britt.). How far this will be found practicable has yet to be demonstrated. At Macedon, near Melbourne, and near Ballarat, also in Victoria, I saw many fine specimens of Douglas Spruce 70 feet and more tall, with plenty of seedling plants growing near them. In these districts this tree will certainly succeed. On other low mountains in the southeast of Victoria I think it probable that this tree will grow and also on the middle slopes of the higher mountains in the southeastern corner of New South Wales. On Mt. Lofty, near Adelaide, I saw young plants and it is possible that it may thrive in parts of South Australia. In Western Australia, Queensland and northern New South Wales there is little liklihood of this tree thriving. In Tasmania I saw no plantation of Douglas Spruce but I believe there is a probability of it succeeding in a few districts where the rainfall is moderately good. In New Zealand it has been experimentally planted in considerable

quantity and in some places is very promising. In the Selwyn plantations on the Canterbury Plain not far from Christchurch there are large trees over 60 feet tall. The trees have grown rapidly but were placed too wide apart and are therefore much-branched. The wood is very brittle I was told. In the Government plantation at Hanmer Springs also near Christ church, and in those round Rotorua in the North Island there are promising young stands of this conifer and the intention is to yearly increase its planting. The neighborhood of Nelson seemed to me a promising place for this tree. In fact I believe that Douglas Spruce will be found to grow well in many parts of New Zealand but whether its wood will equal that from Puget Sound time alone can prove

In South Africa the story is different. There is little hope of Douglas Spruce ever being a useful tree there for forest planting. Here and there on mountains in the southwest corner and perhaps as far east as Knysna spots may be found where this tree will grow well but the possible areas appear to be small. The more southern *Pseudotsuga macrocarpa* Mayr might prove a more adaptable tree in South Africa. On the whole Victoria and certain parts of New Zealand seem to promise best for the growing of the Douglas Spruce.

In New Zealand the Forestry Department has devoted much energy to the planting of Larch and in certain districts success seems tolerably certain. The Rotorua conservancy has more than seven thousand acres of pure stands of European *Larix decidua* Mill. In the valleys and plains it is injured by frosts but on the mountain slopes it grows splendidly and these Larch-plantations are one of the most encouraging sights an advocate of tree planting sees in New Zealand. The thinnings are used for mine props and fuel and no difficulty is found in disposing of them. In the South Island there are some three thousand acres of Government plantations and pure Larch mostly the European species. On the plains it is again not a success but succeeds on the mountain slopes. At Hanmer Springs, Canterbury, I saw over a thousand acres of pure Larch and no one could wish for better growth than this plantation showed. New Zealand is a mountainous country and it would appear that there is very much land suitable for growing Larch. The Japanese Larch (*L. Kaempferi* Sarg.) has been planted on a more limited scale. It grows more slowly than the European but it seems more drought-resistant and so far has proved immune to a disease which in places causes premature needle-shedding in *Larix decidua* Mill. Now that its requirements are understood and if full discretion is displayed it is probable that in New Zealand Larch is destined to rank with *Pinus radiata* D. Don and *P. nigra* var. *Poiretiana* Schneid. (*P. laricio* Poir.) as the most useful of exotic trees for forest planting.

Nowhere else in my travels through the southern hemisphere did I see any serious attempt to grow Larch. On the sub-alpine mountain slopes of eastern Victoria and on those in southeastern New South Wales I

should think Larch could be grown. Also in parts of western Tasmania where on the Button-grass plains the American Larix (*L. laricina* K. Koch) might possibly prove the most accommodating species. Elsewhere in Australia and in the whole of South Africa the growing of Larch is out of the question. The Chinese Golden Larch (*Pseudolarix amabilis* Rehd.) I did not see in Australasia nor South Africa, yet it is a tree which would probably thrive in the strictly temperate regions where the rainfall is evenly distributed through the year or is a summer one.

There seems little chance that Spruce can thrive in South Africa or in Australasia. Many species have been tried but only the Himalayan *Picea Smithiana* Boiss. gives any promise of growing freely. In several places notably the Botanic Gardens at Hobart and on a private estate near Christchurch in New Zealand, I saw fine individual trees of this species. In the Botanic Garden at Grahamstown in South Africa also it does fairly well while in the Botanic Garden in Maritzburg it may be said to flourish. It is possible that places may be found where this Spruce will be a success for forest planting. The Sitka Spruce (*P. sitchensis* Carr.) is the species that the foresters in the antipodes would most like to succeed with. I saw large trees near Ballarat and at Macedon in Victoria and likewise on a private estate near Nelson in New Zealand but they were planted far apart and heavily branched. Red spider seems particularly fond of this tree in southern lands and it is doubtful if it will ever be of importance there. In New Zealand expecially many other species of Picea have been planted but none promise to be of value except an odd tree here and there as ornamentals. Yet one would think that on the cold sub-alpine mountain slopes of southern New Zealand and on the Button-grass plains of northwest Tasmania either the Red Spruce (*P. rubra* Link) or the Norway Spruce (*P. Abies* Karst.) or both would be found to thrive. At any rate in these places they are worth a proper trial. In South Africa and Australia, however, I do not think any of the Spruces will be of any considerable value for forest planting.

What is said of Picea applies equally to Abies. The only species I saw doing well in many places in Australasia was *Abies pinsapo* Boiss. Fine trees of the Spanish Fir are to be seen, notably in Hobart, and if the wood has any value plantations might be made in a number of places. Another species of which I saw good specimens is *A. Nordmanniana* Spach. On Mt. Lofty near Adelaide at Ballarat and Macedon in Victoria at Wellington and near Christchurch in New Zealand there are fine specimens of this Fir. At Hobart there are healthy young trees of *A. pindrow* Spach. In a fine old garden, the Mason Garden at Taita just outside Wellington, New Zealand, now neglected and doomed, there is a fine collection of plants including thickets of huge Himalayan Rhododendrons, a magnificent *Magnolia Campbellii* Hook. f. and many notable conifers, including the Firs named above and also *A. nobilis* Lindl., *A. alba* Mill. (*A. pectinata* DC.), *A. spectabilis* Spach (*A. Webbiana* Lindl.) and *A. venusta* C. Koch

(*A. bracteata* Nutt.). The late T. W. Adams, Greendale, Canterbury, who did much useful pioneer work in experimental tree planting in southern New Zealand, has left it on record that *A. Nordmanniana* Spach, *A. alba* Mill., *A. pinsapo* Boiss. should be largely grown and that *A. concolor* Lindl. and its Californian form, *A. grandis* Lindl. and *A. cephalonica* Loud. gave promise of success. I should think the Algerian Fir (*A. numidica* De Lannoy) would be likely to succeed. For ornamental purposes Firs may be grown here and there in the cooler parts of Australasia but for forest planting there I do not think they have any future. Neither have they in South Africa though near Cape Town I saw good specimens of *A. pinsapo* Boiss.

The Hemlocks are another group of Conifers of no promise in the antipodes. In the old Mason garden near Wellington, New Zealand, I saw fair specimens of the western *Tsuga heterophylla* Sarg. and *T. Mertensiana* Sarg. and, at Queenstown on Lake Wakatipu in the South Island a good tree of the Himalayan *T. Brunoniana* Carr. Of the Japanese and eastern North American species I saw no trees worthy of comment.

In the Botanic Gardens, Sydney, and in the nursery grounds belonging to the Forestry Department at Gosford, much to my surprise I saw trees of *Keteleeria Fortunei* Carr. They were of no size but were fruiting and had evidently grown slowly and the species is evidently of no value in forestry. It occurred to me that *K. Davidiana* Beiss. from Formosa and western China might succeed. This is a large tree which furnishes good timber and thrives under conditions too arid and too warm for either Spruce or Fir its close relatives.

In the Botanic Gardens, Sydney, there are large handsome trees of *Taxodium distichum* Rich. and *T mucronatum* Ten., the Swamp Cypress, those of the Mexican species being particularly noteworthy. At Melbourne there are also good trees. In the Municipal Gardens, Cape Town grow large trees of the typical *T. distichum* Rich. and of the var. *imbricarium* Sarg. with acicular leaves. It is evident that these trees are suited to certain parts of both continents. The Forestry Department of South Africa are intent on testing these trees and Australia might well do likewise.

In southeastern Australia the Redwood (*Sequoia sempervirens* Endl.) has been planted in many places for ornamental purposes but I saw none that looked really thrifty. The growth is slow the branches sparse and the trees of untidy appearance. In New Zealand I saw better trees but was nowhere favorably impressed with the suitability of this tree for forest planting. The Big Tree (*Sequoia gigantea* DC.) on the other hand grows rapidly when the soil is good. At Macedon there are some truly gigantic trees of this noble conifer. At Ballarat also there are fine specimens; likewise in private gardens on Mt. Lofty near Adelaide and elsewhere in South Australia. At Hobart, Launceston and other places in Tasmania, the Mammoth Tree flourishes exceedingly whereas its relative the Redwood

merely exists. In New Zealand especially in the vicinity of Christchurch and Nelson I saw fine trees. At Hanmer Springs, Canterbury, the Forestry Department have about five acres of this tree planted pure and doing well. Given deep soil there is no doubt this tree can be grown to perfection in many of the cooler parts of Australasia though I do not think it will be valued other than for ornament. It is a fine avenue tree where it thrives. In Western Australia it is of no value. For South Africa neither the Redwood nor Mammoth Tree are likely to be of service for forest planting. Of the Redwood I made no note of any particularly good specimen but of the other I saw fine trees in cities so far apart as Pretoria, Maritzburg, Grahamstown and Cape Town. The Chinese *Cunninghamia lanceolata* Hook. is a failure in the antipodes and the same is true of the Japanese *Cryptomeria japonica* D. Don, though in New Zealand I saw a few good plants of the variety *elegans* Mast. The wet climate of New Zealand one would think would suit this tree but though it has been tried in many places it has not been a success. For no apparent reason many trees refuse to become acclimated in foreign lands. The Cryptomeria is one of these and the only place in the world outside of Japan that I have seen this tree really flourishing is Darjeeling and its vicinity in north India.

In many parts of eastern Australia, in New Zealand and Tasmania, the species of Cedrus do well. In South Australia and Victoria in particular they grow fast. At Ballarat *Cedrus deodara* Loud. is particularly noteworthy and scarcely less so is *C. libani* Loud. At Macedon these and *C. atlantica* Manetti all do equally well while at Hobart the Atlas Cedar is best, and is used as an avenue and memorial tree. On the Canterbury Plain round Christchurch in New Zealand the Deodar is perhaps the most successful but the Atlas Cedar also does well. At Wellington both flourish and grow much faster than the Lebanon Cedar. There are of course no noteworthy specimens such as the Cedars of Lebanon England can boast but there is ample evidence that these Cedars are suited to the climate of many parts of Australasia except Western Australia. As ornaments they have proved their value in many places and the Deodar at least is worth a trial for forest planting where summer and all the year round rains prevail. It is being tried in a few places in South Africa but the experiments need to be conducted over a greater period of time before conclusive data can be obtained. In and near Cape Town and other large cites in South Africa there are good specimen trees of all three species of Cedrus showing that they will grow in this subcontinent.

A group of northern trees which does well in many parts of Australasia and South Africa is Cupressus. Many species are grown in these lands but unfortunately their identity is much confused. I believe that most of the known species have been introduced but their nomenclature is in dreadful confusion and in the absence of authentic specimens in the southern hemisphere it is impossible for those living there and interested in these trees to correctly name them. A good illustrated monograph of

this genus is much needed. I collected herbarium material in different places but have not yet had time to examine it. Five species I know sufficiently well to be sure of their identity but the others I shall mention under the names they are known by in particular localities. The most widely grown is the Monterey Cypress (*Cupressus macrocarpa* Hartw.). In Australia it is very generally known as the "Macrocarpa" tree without any generic name. In Kenya Colony in equatorial Africa the name is changed to "Microcarpa." The general application of the specific name either rightly or wrongly rendered as a vernacular name is proof of the popularity of this tree. It is as a hedge plant that it is most widely employed but as an ornamental tree it has been planted in great numbers. Though it does not thrive everywhere in the antipodes it succeeds throughout a greater area than almost any other exotic tree. In Western Australia it has a bad habit of dying suddenly and hedges of it are often patchy as blocks of it die in the hedgerow. On this account it is losing popularity in that state. In eastern Australia it flourishes and is a most popular hedge plant. It is also much planted in New Zealand and South Africa. I saw many fine specimen trees in the antipodes, the grandest I think are growing in the grounds round the Salmon ponds, New Norfolk, Tasmania. They are not much more than fifty years old and are fully 80 feet tall and 12 feet in girth of trunk. For forest planting the Cupressus as yet have scarcely been employed but the fact that their wood is very lasting in the ground and therefore most suitable for fencing makes them valuable. I saw one or two small experimental stands and the rate of growth was quite satisfactory. At Tokai, near Cape Town, there are small stands of several species but the names are confused. The Mediterranean species (*C. sempervirens* L.) and its fastigiate form *stricta* Ait. have been much planted as ornamental trees and in general does well in many places in eastern Australia and South Africa. In the vicinity of Adelaide they are notably successful, also at Hobart. For forest planting in South Africa and eastern Australia, the Nepal Cypress (*C. torulosa* D. Don) and the so-called Portugal Cypress (*C. lusitanica* Mill.) promise most. At Salisbury in Rhodesia these are the only two exotic conifers that really thrive and the Nepal Cypress grows faster and better. At Maritzburg both do well and the same is true at the Cape though there the Portugal Cypress is the more common. In New Zealand, South Australia and in Victoria I saw many good trees of both species and at Hobart *C. torulosa* D. Don is particularly good. Here and there in eastern Australia I saw fine specimen trees of the Chinese *C. funebris* Endl. but I do not think it has value there for forest planting. The same is true in South Africa. In several places in eastern Australia I saw nice trees of a Cypress known as *C. Lindleyi*. It has bluish green foliage, hanging branchlets and small fruit. At Nairobi in Kenya Colony, almost on the Equator in central Africa, a species of Cypress from Guatemala thrives better than any other exotic conifer and will certainly prove a useful subject. Trees under the names of *C. Goveniana*

C. Macnabiana, *C. Benthamii*, *C. Knightiana*, *C. glabra*, and *C. arizonica* are growing in South Africa and Australasia but how far these names are correct I am not yet in a position to determine. As a group, Cupressus is a success in many parts of the southern hemisphere visited by me and they have a decided future not only as ornamental trees but as trees for forest planting, but before this can be properly embarked upon their nomenclature must be straightened out since all species do not thrive equally well. As with other trees some are better suited to certain localities than others but since different species are in different places known under the same name it is impossible to say much about the behavior of the different species.

The Chamaecyparis do not promise to succeed though *Chamaecyparis Lawsoniana* Parl. has been much planted in New Zealand, Victoria and elsewhere but almost exclusively as an ornamental tree. Occasionally good specimens are seen as on Mt. Lofty near Adelaide and the same is true of *C. nootkatensis* Sudw. The Japanese species are a failure except here and in gardens yet in Natal I think that the Formosan *C. formosensis* Matsum. should be given a good trial. In the old Mason garden near Wellington there are fine old trees of *Libocedrus decurrens* Torr. but I saw none of special merit elsewhere. In New Zealand a few small plantations of *Thuja plicata* D. Don under the name of *T. gigantea* have been made but their rate of growth is very ordinary and there is nothing to indicate that this tree will be of value there or elsewhere in Australasia. In fact apart from Cupressus none of the exotic Cupressineae give promise of being important as a source of timber though several are useful ornamental trees in the southern hemisphere.

Several species of Juniper were long ago introduced into the southern hemisphere as ornamental trees. Recently attention has been drawn to them as possible supplies of wood for pencil making but it seems doubtful if they will be of use for this purpose in the antipodes. A number of the tree species grow very well but the rate of growth is not rapid. If any species is likely to be of value I should think it would be the gigantic *Juniperus procera* Hochst. so important a tree on the highlands of Kenya Colony, equatorial Africa, and north to the mountains of Abyssinia. The largest Junipers I saw were of the Bermuda species (*J. barbadensis* L.) in the town of Maritzburg, Natal. They grow on some church property and the trees are fully 60 feet tall and 8 feet in girth of trunk. I saw this tree in several other places in South Africa and also in eastern Australia but though many were nice specimens they were inferior in size to those in Maritzburg. In eastern Australia and Tasmania I saw good trees of *J. excelsa* Bieb. and this with the Bermuda Juniper appear to grow better than others. Both *J. virginiana* L. and *J. chinensis* L. have been planted but neither are any great success though the American species does fairly well on parts of the Canterbury Plain, New Zealand. At Hobart there are shapely trees of *J. drupacea* Labill. and in the various Botanic Gardens

of eastern Australia I saw healthy young trees of *J. Cedrus* Webb & Berth. native of the Canary Islands. The best of all species for pencil cedar-wood (*J. lucayana* Britt.) I did not see anywhere in the antipodes nor such fine species as *J. mexicana* Spreng., *J. occidentalis* Hook. and *J. monosperma* Sarg. These I should think worth a trial. They are certainly ornamental trees and so, too, is the Checkered-bark Juniper (*J. pachyphlœa* Torr.) which is occasionally grown in the gardens of southeastern Australia. The Japanese *J. procumbens* S. & Z. does well in gardens in southeastern Australia and New Zealand and is in fact a greater success than any other Japanese conifer. In many places red spider plays havoc with Junipers and nowhere in the antipodes do they seem to grow rapidly. The wood lasts indefinitely in the ground but so does that of the Cupressus and the Australian Callitris and it would appear to me that these trees are better suited to the climates of Australia and South Africa.

NORTHERN HARDWOOD TREES

A large number of species of northern broad-leaf trees have been planted in Australasia and South Africa but with few exceptions they are not a success. For forest planting none are of outstanding promise and in South Africa and Australia south of the tropic the Eucalyptus is the hardwood tree par excellence. In fact it seems probable that the genus is destined to supply the greater part of the world's future needs of hardwood timber. A few kinds of wood used for special purposes will always have their own market but for general construction purposes Eucalyptus-timber will become more and more important. In South Africa they grow 10 feet a year and out of the great number of species there are some suited to all climates from temperate to tropical. I very much fear that our northern trees, neither at home nor abroad, will be able to compete with these lusty, vigorous southerners in the field of commercial forestry. In New Zealand but a few species of Eucalyptus grow well and these only in limited areas but even there they do better than any of our northern broad-leaf timber trees.

The common European Oak (*Quercus robur* L.) has been extensively planted in Australasia and South Africa and in general one must suppose that sentiment rather than business acumen is responsible for this. Those who have given any attention to the matter have realized that this Oak is not suited to the prevailing climatic conditions and yet sentiment, and to this may be added ignorance and enthusiasm, still causes these trees to be planted in quantity. Memorial trees to those who fell in the Great War have been planted in many lands—a commendable thing to do in any country—but if the memorial is to be worthy and lasting, and such its promoters fully intend it to be, the planting of trees suitable to the country is of fundamental importance. This has rarely happened where the white man rules. At Perth, the capital city of Western Australia, in King's Park an effort to plant a long avenue of such trees has been made

and in every instance the trees are of exotic origin and the probability of any of them growing into specimens of even moderate size is very remote. The common European Oak figures prominently in this avenue but is fore-doomed. In southeastern Australia this Oak has been much planted for ornamental purposes in parks, gardens and streets. A few good specimens may be seen, notably in Melbourne, but these are the exception and the usual trees are stunted in growth and liable to disease. A scale insect is a great scourge killing the trees outright in three years I was told. In Tasmania the same is true except that the scale pest is only just beginning its devastations there. In New Zealand, especially the South Island, many plantations of *Quercus robur* either pure or mixed with other northern broad-leaf trees or with Pines have been made but as a source of merchantable timber are an obvious failure. In many places it grows rapidly at first but after a few years becomes almost stationary. In South Africa as far north as Pretoria the Oak has been planted. Around Cape Town, there are quite extensive groves and the acorns are a marketable commodity as feed for pigs. In some of the suburbs of Cape Town there are large trees and the town of Stellenbosch, thirty-one miles from Cape Town and the second oldest settlement in South Africa, is famous for its Oaks. This town was founded by Simon van der Stel in 1680 and the Oaks were planted by his order soon afterward. Francis Masson, the first plant collector sent out from Kew, visited Stellenbosch in December, 1772, and commented on the row of fine Oaks on either side of the solitary street. In 1922 I found that Stellenbosch now boasted more than a solitary street and that the Oaks are still in excellent health and a credit to the town. The largest trees are less than a hundred feet tall and about ten feet in girth of trunk. The climate evidently suits them but considering their age, well over two hundred years, their size cannot be considered remarkable. Both in South Africa and Australia for forest planting it is folly to plant this Oak since Eucalpytus yielding a timber equally useful, will attain the dimensions of the famous Stellenbosch Oaks in twenty-five years. In the South Island of New Zealand where Eucalyptus is scarcely happy there is good excuse for experimenting with the Oak but I saw nothing to warrant optimism about it.

The Turkey Oak (*Q. Cerris* L.) is better suited to the climates of South Africa and southeastern Australasia but is very little grown, and its wood is of inferior quality. In the Melbourne Botanic Gardens there is quite a good collection of species of Oaks. It includes a number of American species and I noted fair trees of Swamp White Oak (*Q. bicolor* Willd.), Red Oak (*Q. borealis* var. *maxima* Ashe), Scarlet Oak (*Q. coccinea* Muench.), Black Oak (*Q. velutina* Lam.), Pin Oak (*Q. palustris* Muench.), White Oak (*Q. alba* L.) and others including the Bur Oak (*Q. macrocarpa* Mich.). On the whole they were a creditable lot of trees and the presence of healthy specimens of the White Oak surprised me but there was nothing to indicate that they have value as trees for forest planting. At Hobart I saw good

trees of the Red Oak. The Spanish and north African *Q. Mirbeckii* Durieu, which often goes by the mysterious name of "Q. Hodginsonii," and the related *Q. lusitanica* Lam. do quite well round Adelaide, Melbourne and even Sydney and on the Canterbury Plains in New Zealand. The Oaks of Japan and China do not flourish and even the widely distributed *Q. variabilis* Bl. and *Q. serrata* Thunb. are stunted and worthless. The evergreen Oaks do better in the southern hemisphere than the deciduous leaved species. Such species as the Holm Oak (*Q. Ilex* L.) the American Live Oak (*Q. virginiana* Mill.) and the Himalayan *Q. incana* Roxb. do really well and could be used for shade and avenue trees to advantage in many places. Just outside Cape Town I saw very large trees of the Cork Oak (*Q. suber* L.) and this species seems perfectly happy there. At Hobart and other places in southeastern Australia I saw nice specimens of the Cork Oak but all mere pygmies compared with the giants at the Cape. For ornamental purposes I should think that *Q. lobata* Née, *Q. agrifolia* Née and other species indigenous in California and also those of Mexico would be worth a trial in South Africa and southeastern Australia.

The handsomest and most flourishing northern tree in southeastern Australia is *Salix babylonica* L. The finest specimens in all the world of this tree are surely there and thousands of them. Anywhere alongside of water from Adelaide east to the Pacific and north to beyond Sydney it is a thing of beauty. On the upper reaches of the Murrumbidgee, round Tumut, I saw many notable specimens. Not only is this tree beautiful but it is also very useful, affording welcome shade to man and beast and in times of drought its leafy branches are greedily eaten by stock of all kinds. In Tasmania, notably at New Norfolk on the banks of the river Derwent, this Willow is perfectly at home. In New Zealand it is not so great a success and is much less plentiful, one reason being that the climate of most of the South Island is really too cold. In South Africa the Weeping Willow does almost as well as in southeastern Australia though it has not been planted in such quantities. Popular belief in Australia has it that all the older trees came as cuttings from Napoleon's Willow at St. Helena. This island was formerly an important port of call on the voyage from and to Europe and so the lovely Babylon Willows of Australasia may be descended from those earlier introduced into St. Helena.

In the South Island of New Zealand the White Willow (*Salix alba* L.) and the Crack Willow (*S. fragilis* L.) are of immense importance in keeping the rivers within bounds. For this purpose they have been planted in vast quantities along the river margins and are as much at home as if native of the country. The common Hawthorns of Europe (*Crataegus Oxyacantha* L. and *C. monogyna* Jacq.) are the hedge plants of this same part of New Zealand. Many hundreds of miles of hedges are made solely of these Thorns. Nothing could serve the purpose better or be more amendable but as the host of Fire-blight they have become a menace in the Apple growing regions. To the sheep and cattle farmers these thorn

hedges are indispensable and the interests of these farmers are of greater value to the country than those of the Apple-grower who would much like to have all the thorn hedges destroyed. In Tasmania these European Thorns also flourish and at Hobart I noted nice trees of the black fruited *C. Douglasii* Lindl. of western North America and the Washington Thorn (*C. phaenopyrum* Med.) with its cheery scarlet fruit. The common European Alder (*Alnus glutinosa* Gaertn.) has been largely planted in New Zealand and in wet places does well. There seems to be a particular reason for planting this tree and if timber is the object it would be better to plant *Alnus japonica* S. & Z. which grows rapidly to a large size. On the pumice and volcanic ash of the Rotorua region and elsewhere in New Zealand *A. firma* S. & Z. ought to be a useful tree since it is at home under such conditions in Japan.

A few years ago *Catalpa speciosa* Engelm. was boomed for forest planting. In New Zealand alone millions of these trees were planted but few survive and none show any promise of growing into timber producing size. In eastern Australia the experiment was also tried in places on quite a large scale, but the results proved equally barren and disappointing. In these same countries the Black Locust (*Robinia Pseudoacacia* L.) has also been planted on a considerable scale but it grows slowly and does not promise to be of economic value. But a South American tree, *Schinus Molle* L. (the Pepper Tree of California) has proved of much value both in South Africa and Australia. In the dry interior regions of both lands it is a veritable Godsend as a source of shade. At Kalgoorlie on the gold-fields of Western Australia it is almost the only tree that can be grown there. For towns and homesteads situated in arid places its planting cannot be too strongly encouraged; but it should be more or less restricted to such regions and not planted promiscuously over the whole country as is now done. At Adelaide grow the largest Pepper-trees I have seen and in the relatively dry climate little can be urged against its presence but in wetter climates it ought not to be grown. Its fruit has a deleterious effect on chickens and some contend that its mere presence militates against the health of poultry.

The London Plane (*Platanus acerifolia* Willd.) has of course been carried to the southern hemisphere for street and avenue planting. Where summer rains prevail it is often a success, in some places notably so, in others it fails. Where winter is the season of rains it cannot be recommended. The finest avenues and groves of this tree I saw in Australia are in Adelaide and Ballarat. They are very fine in Melbourne also. In these places the tree grows rapidly, is free of disease, gives an abundant of much needed shade and can be highly recommended for park planting especially. In certain places in the South Island, New Zealand, the London Plane does moderately well but it is not so happy as in Victoria and South Australia. In Western Australia, Queensland and much of New South Wales it is worthless or virtually so. As a street tree in Pretoria, in the

Transvaal and in some other places in South Africa this Plane-tree is a success. At Maritzburg in Natal, it flourishes and in the Botanic Garden there it makes a fine avenue. At Pretoria *P. Wrightii* S. Wats., native of Arizona and New Mexico, is planted as a street tree and grows well though it is inferior for this purpose to the London Plane on account of the narrower acute lobes in the leaves which are inclined to droop and furnish less shade. The presence of this unusual tree was a great surprise and I could scarcely believe it was the true *P. Wrightii* S. Wats. I have since compared specimens from Pretoria with authentically named material in the herbarium of the Arnold Arboretum and its identity is certain. Evidently this western Plane finds the climate of Pretoria to its liking though as the trees are all young and now not more than twenty-five feet tall it is too early to judge of its permanent value.

The Maples thrive indifferently in Australasia and the Lindens, Horse-chestnuts and Chestnuts not at all. Here and there the English Elm (*Ulmus procera* Salisb.) luxuriates. Round the race course at Tumut in New South Wales there are some exceptionally fine trees of this Elm. At least I believe them to be this species though their habit of growth recalled the American White Elm (*Ulmus americana* L.) At Ballarat in Victoria a memorial avenue some two miles long to the soldiers who took part in the Great War is of Elm-trees. I hope that they will flourish but am not sanguine about them.

Various species of Ash have been planted in some quantity in south-eastern Australia and New Zealand and here and there they grow very well. The European *Fraxinus excelsior* L. and the American *F. americana* L. do equally well where the soil is deep and good. At Campbelltown near Sydney and again at Greendale on the Canterbury Plain I saw *F. oregona* Nutt. growing freely. At Adelaide grow many Ash-trees including quite a good avenue of *F. chinensis* Roxb. in which the trees are taller and of greater girth than I have seen this tree elsewhere including its native country China. In the southern parts of New Zealand it is possible, though I scarcely think probable, that Ash may be useful in forest planting as a source of timber but in Australia and Tasmania it cannot compete with certain species of Eucalyptus (*Eucalyptus gigantea* Dehnh. and *E. obliqua* L'Hérit. for example) which yield wood of very similar character.

The Birches are not a success in Australasia though in New Zealand the European *Betula pendula* Roth has been much planted in mixed stands with other exotic trees. Of Beech I saw a few healthy trees of *Fagus sylvatica* L. on a private estate, Stoke, just outside Nelson in New Zealand but have no other record of meeting with it on my travels through Australasia. The Black Walnut (*Juglans nigra* L.) does not thrive in these southern countries but at Gosford not many miles from Sydney, New South Wales, I saw several species of Hickory doing well. The man in charge claimed to have no difficulty in transplanting them, his method being to severe the tap root with a sharp knife and sear it with a hot iron.

I quote his method without endorsing its efficacy except to state that he succeeded in the difficult task of transplanting these trees. I firmly believe that in rich alluvial soils in southeastern Australia the Pecan (*Carya pecan* Asch. & Graeb.) and other valuable species will someday be grown in quantity. There are also places in South Africa where these trees would grow well. In the Botanic Gardens, Maritzburg, Natal, several species flourish and one tree of *C. pecan* is fully 75 feet tall and 5 feet in girth of trunk. As a source of timber I see no future for Hickory in the southern Hemisphere but those species, varieties and hybrids which bear nuts good to eat will someday be successfully grown in these lands.

The Tulip-tree (*Liriodendron Tulipifera* L.) and the Sweet Gum (*Liquidambar Styraciflua* L.) grow well in many places in South Africa, southeastern Australia and New Zealand but they require deep soil. It would be rash to prophecy the value in forest planting of these trees but that they will grow in favorable places is proved. The best Tulip-trees I saw on my travels are growing in the Botanic Garden, Maritzburg, Natal, where there are specimens 80 feet tall and 7 feet in girth of trunk at 41 years of age. Another American tree, the noble *Magnolia grandiflora* L. thrives in many parts of the southern hemisphere visited by me. In the various Botanic Gardens and on many private estates I saw very fine trees. With its large, glossy green leaves and handsome flowers this Magnolia has few equals as an ornamental tree where climate suits it. Except in a few gardens in New Zealand, like the old Mason garden near Wellington, the Asiatic Magnolias are not a success in Australasia.

The Pride of India or Persian Lilac (*Melia Azedarach* L.) has been overplanted in Australasia and South Africa as elsewhere in the warmer parts of the world. One seldom sees a good tree and though undeniably pretty in blossom it is not a thing of beauty for much of the year. In South Africa for some unknown reason it goes by the name of "Syringa." It is a fast growing tree which seeds freely and is apt to become a weed in places where it flourishes. The Tree of Heaven (*Ailanthus altissima* Swingle) does well in regions of summer and all the year round rainfall though it is not so common as one would have thought. There are very good trees in and round Adelaide, South Australia. Gardens of the same city and also of Melbourne and elsewhere in Victoria boast many nice trees of *Cercis Siliquastrum* L., the Judas-tree, The Olive (*Olea europaea* L.) grows well in many parts of Australia and South Africa but the fruit is very inferior.

The Camphor (*Cinnamomum Camphora* Nees & Eberm.) has been much planted in southern lands and grows well in a variety of climates. As a shade tree it is much to be recommended but I heard of no camphor having been extracted from it neither do I think there is any liklihood of such a thing taking place on a commercial scale anywhere in the antipodes. For forest planting I see no future for the Camphor-tree but for ornamental purposes, either as specimens or for avenues and as a street tree it is likely

to prove on account of its adaptability one of the most useful broad-leaf evergreen trees introduced into the southern hemisphere. Another evergreen tree which does well in the regions of which I write is *Ligustrum lucidum* Ait. In the city of Pretoria in the Transvaal this Privet is used as a street tree and to good effect. Trained to a single stem and its crown kept within bounds by judicious pruning it is ideal for city squares and streets where small trees are in request.

In many parts of southeastern Australia the Osage Orange (*Maclura pomifera* Schneid.) has been planted chiefly for hedges and around Tumut in New South Wales I saw large trees. In the drier and interior parts of Australia I should think the Mesquite (*Prosopis juliflora* DC.) and its varieties *glandulosa* Cock. and *velutina* Sarg.) well worth planting. As food for stock they are of great value in Texas and elsewhere in this country and there is no reason why they should not be equally valuable in Australia. Their wood is almost indestructible in contact with the soil and is most serviceable for fencing purposes, railway ties and the underpinnings of buildings; the ripe pods supply Mexicans and Indians as well as cattle with a nutritious food.

Of the famous Dragon-tree of Teneriffe (*Dracaena draco L.*) there are plenty of large trees in Australia and South Africa where it is evidently favored. That fine Palm, *Phoenix canariensis* Chabaud, is quite at home in eastern Australia where in Sydney and elsewhere many fine specimens are to be seen. The same is true of the Fan Palm (*Washingtonia filamentosa* O. Kuntze) native of the dry parts of southern California and adjacent regions. Speaking of Palms, though not a northern species *Jubaea spectabilis* H. B. & K., the Coquito Palm of Chili, is worthy of mention since so many magnificent specimens of it grow in Australia, those in the Adelaide Botanic Gardens being exceptionally fine. Another South American tree much used in South Africa and eastern Australia in gardens and for street planting is *Jacaranda mimosifolia* D. Don. With its finely divided leaves and large erect panicles of violet-blue Foxglove-like flowers this must be counted one of the world's most pleasing small trees. In eastern Australia this Jacaranda is hardy as far south as Adelaide and flourishes northward to Brisbane. In South Africa it is a feature of the streets of Pretoria.

Suitable wood for match splints is a desideratum in Australasia and South Africa. Poplars are being experimented with as a source of supply. In South Africa *P. canescens* Smith has been much planted and is naturalized in places so far apart as Pretoria and Cape Town. At Johannesburg and elsewhere I saw plantations of this tree. In Cape Town and the neighborhood there are many large trees of the Gray Poplar. The wood is being used for match splints and is at present the main source of supply The so-called *P. monilifera* Ait. under the name of *P. deltoidea* var. *missouriensis* (the correct name of which is *P. balsamifera* var. *virginiana* Sarg.) is being experimented with and promises to grow rapidly in South Africa

and also in the South Island of New Zealand. In the latter country *P. alba* var. *pyramidalis* Bge. (*P. Bolleana* Lauche) does very well and ought to be given a good trial in South Africa, and so, too, should the Carolina Poplar of American nurseries, a supposed hybrid between *P. balsamifera* L. and the Lombardy Poplar and named *P. canadensis* var. *Eugenei* Schelle. The Lombardy Poplar (*P. nigra* var. *italica* Dur.) is, of course, planted in many places and thrives in not a few but its use is mainly as a wind-break. The White Poplar (*P. alba* L.) from some reason or other appears to be rare, at least in the parts of the southern hemisphere visited by me. There is little hope of the Aspens (*P. tremula* L. and *P. tremuloides* Michx.) being successfully grown, much less naturalized, in the antipodes except possibly on the mountains in southern New Zealand. The north China *P. tomentosa* Carr. is a species worthy of trial in South Africa and New Zealand and one would think that the species from the dry sunny regions of southwestern North America were worth experimenting with especially in South Africa. For example such species as *P. arizonica* Sarg., *P. texana* Sarg., *P. Fremontii* S. Wats. and *P. McDougallii* Rose ought certainly to be given a good trial.

What I have written does not pretend to exhaust the list of Soft and Hardwood northern trees introduced into Australasia and South Africa though no tree of proved importance has been omitted If the home of these trees be inquired into it will be seen that it is the trees of western North America from central California southward including Mexico, those of the Mediterranean region including the Levant and those of the northwest Himalayas that grow best in the southern lands under review. The trees of China and Japan, with the exception of the Babylon Willow (*Salix babylonica* L.) and the Camphor-tree (*Cinnamomum Camphora* Nees & Eberm.), those of northern Europe, except the Larch (*Larix decidua* Mill.) and White Willow (*S. alba* L.) in New Zealand and *Quercus robur* L. at the Cape of Good Hope, and those of eastern North America, except the Tulip-tree (*Liriodendron Tulipifera* L.) and Sweet Gum (*Liquidambar Styraciflua* L.), grow badly and give little promise of success. The trees of southeastern United States, especially certain species of Pinus, ought to be given a fuller trial, for very possibly they like their fellow countrymen, the Swamp Cypress (*Taxodium distichum* Rich.) and the Bull Bay (*Magnolia grandiflora* L.), will be found to thrive where climate, soil and rainfall are favorable. It is only by experimental planting that the value of any tree can be determined. As far as my observations go and granted that the minimum temperature is not too low, the only point of practical importance to be kept in view in the planting of exotic trees is that of the season of rainfall. In lands of marked wet and dry seasons it does make an enormous difference in the behavior of tree-growth whether the wet season is that of winter or of summer. Where rainfall is sufficient the chemical properties of soils appear to be of much less importance than their physical character. As proof of this I may instance *Pinus radiata* D.

Don and *P. nigra* var. *Poiretiana* Schneid. which in New Zealand thrive equally well on the poor volcanic soils of Rotorua and the rich alluvial soils of the Canterbury Plain. There are, of course, minimum and maximum temperatures below and above which no species of tree will flourish but with few exceptions excess of heat is better withstood than that of cold.

From the point of view of timber the Long-leaf or Southern Pine (*P. palustris* Mill.) is the finest species of Pinus in the world. In the coastal regions of Natal and those of New South Wales and Queensland where a summer rainfall prevails this species, together with *P. taeda* L., *P. caribaea* Morelet, *P. glabra* Walt., *P. occidentalis* Swartz and *P. echinata* Mill., ought to be given a thorough trial.

Tabulated the Softwood northern trees of proved or probable value for forest planting in Australasia and South Africa are:—

Western Australia
- Pinus canariensis
- Pinus pinaster
- Pinus radiata (in good soil)
- Cupressus lusitanica (in good soil)

South Australia
- Pinus radiata
- Pinus pinaster
- Pinus canariensis
- Taxodium distichum

Victoria
- Pinus radiata
- Pinus ponderosa
- Pseudotsuga taxifolia
- Cedrus deodara
- Cedrus atlantica
- Taxodium distichum
- Cupressus macrocarpa
- Cupressus torulosa

New South Wales
- Pinus ponderosa
- Pinus longifolia
- Pinus nigra var. Poiretiana (on the higher mountain slopes)
- Pinus radiata (in the dry interior regions)
- Cedrus deodara
- Taxodium distichum
- Cupressus macrocarpa
- Pseudotsuga taxifolia (on the higher mountain slopes)

Queensland
- Pinus longifolia

Pinus Montezumae
Pinus radiata (on the highlands of the interior)
Pinus ponderosa (on the highlands of the interior)
Taxodium distichum

Tasmania
Pinus radiata
Pinus pinaster
Pinus ponderosa var. Benthamiana
Pinus nigra var. Poiretiana
Cedrus deodara
Cedrus atlantica
Cupressus macrocarpa
Cupressus lusitanica
Cupressus torulosa
Picea Abies

New Zealand
Pinus radiata
Pinus nigra var. Poiretiana
Pinus ponderosa
Pinus ponderosa var. scopulorum
Larix decidua
Larix Kaempferi
Pseudotsuga taxifolia
Cedrus atlantica
Cedrus deodara

South Africa where winter rainfall prevails
Pinus radiata
Pinus pinaster
Pinus canariensis
Cupressus lusitanica
Cupressus macrocarpa

South Africa where summer rainfall prevails
Pinus longifolia
Pinus ponderosa var. arizonica
Pinus ponderosa var. macrophylla
Pinus patula and other Mexican species
Cupressus torulosa

Natal
Pinus longifolia
Pinus palustris
Pinus taeda
Pinus caribaea
Pinus echinata
Pinus glabra

CONCLUSION

SOUTHERN TREES IN NORTHERN LANDS

In bringing this article to a close it may not be out of place to inquire briefly into the value of the trees of the southern hemisphere to the North. At the outset it is well to emphasize that in the North there is little land-surface enjoying a climate favorable to the growth of these trees. None of the softwood trees of the antipodes are ever likely to be of value in forest planting in the northern hemisphere. Fortunately we are well supplied with trees yielding this class of timber and need no help. Several species of the Australian Callitris are useful to South Africa but promise nothing for us. Of hardwood trees the species of Eucalyptus of Australia are the southern hemisphere's great gift to forestry. Of great value to South Africa they have proved valuable in California, Mexico and some of the countries of western South America and of the Mediterranean Basin. In California many species are cultivated and I believe that some like *Eucalyptus salmonophloia* F. v. Muell. and *E. salubris* F. v. Muell. will be found to be especially useful in the dry southwestern states and in Mexico for forest planting. In parts of south India, especially on the Nilghiri Hills, the common Blue Gum (*E. globulus* Labill.) is now the chief source of fuel. Other species grow well and have a decided future before them in south India and also in the drier northwestern parts of Ceylon. But after all the value of Eucalyptus to countries north of the Equator is slight in comparison to what it is in the southern hemisphere where their growth is so extraordinarily rapid. The wood of the different species is of great variety and it seems likely that the genus Eucalyptus is destined to supply the bulk of the world's future needs of ordinary hardwood timbers. The ornamental character of a number of species of Eucalyptus is considerable and few exotic trees in California are more lovely when in flower than the red-flowered *E. ficifolia* F. v. Muell. of Western Australia. The Blackwood (*Acacia melanoxylon* R. Br.), indigenous in southeastern Australia and Tasmania, is one of the valuable timber trees of the world. It grows well on the Nilghiri Hills in southern India and on the highlands of equatorial Africa. In these countries it has decided value as a forest tree and very probably there are other countries north of the Equator where it will flourish.

Another useful Australian tree *Grevillea robusta* A. Cunn., is much used for a shade tree over Coffee, Cocoa and other tropical economic crops and is widely planted for ornamental purposes in many warm regions of the earth. The Black and Green Wattles, *Acacia decurrens* Willd., and its variety *mollis* Benth., are of immense importance as a source of tanning material and Natal is now the headquarters of this industry. On the highlands of Kenya Colony in equatorial Africa these Wattles have been largely planted but freights are excessive and Kenya cannot compete with Natal. Coal is not known to occur in Kenya Colony and it had been hoped

that the wood of these Wattles would be valuable as fuel for the locomotives, but the railway grades are steep and the calorific quality of the wood is too low for the intended purpose and the experiment is a failure. On the Nilghiri Hills these Acacias grow freely and so too does the Silver Wattle (*A. dealbata* Link). The latter owing to its suckering proclivities has become a pest though it is serviceable in preventing landslides on railway embankments and dykes. Gardens owe much to Australia for its lovely Acacias. Such species as *A. Baileyana* F. v. Muell., *A. longifolia* Willd., *A. pycnantha* Benth., *A. pubescens* R. Br. and *A. dealbata* Link. being among the choicest trees grown in southern California and in the Mediterranean region. Two Palms, *Howea* (Kentia) *Belmoreana* Becc. and *H. Fosteriana* Becc., indigenous on Lord Howe Island off New South Wales, are indispensable to florists of the North. In South Africa the Western Australian *Acacia saligna* Wendl. with *Pinus pinaster* Ait. has done much towards reclaiming the sandy flats behind Cape Town. The Australian *Albizzia lophantha* Benth. is also a useful plant in northern gardens under glass and so, too, is the Norfolk Island Pine (*Araucaria excelsa* R. Br.). The Bunya Bunya (*A. Bidwillii* Hook.), flourishes near Darjeeling in north India and on the Nilghiri Hills in the south. In Natal these two Araucarias with *A. Cookii* R. Br. and *A. Cunninghamii* Sweet are likely to be of value in forest planting. Curiously enough the Chilian Pine (*A. imbricata* Pavon) does not do well in Australasia nor in South Africa but in Kenya Colony at about 7000 feet altitude the Brazilian species (*A. braziliensis* A. Rich.) grows faster than any other exotic Conifer. I should think that *Fitzroya patagonica* Hook. f., which is one of the most magnificent timber trees of the temperate regions of South America, would be well worth trying in parts of New Zealand and in southeastern Australia where summer or all the year round rainfall obtains.

None of the South African trees are of any proved value to northern gardens though in California the Silver-tree (*Leucadendron argenteum* R. Br.) and the Cape-chestnut (*Calodendron capense* Thunb.) are occasionally seen. In eastern Australia the latter is one of the favorite exotic flowering trees. The trees of New Zealand are equally unimportant to the North. The Kowhai (*Sophora tetraptera* Ait.) is occasionally grown and some of the Nothofagus are planted in England where their growth in the most favored places is slow compared with that of the South American species. For gardens the only really outstanding New Zealand tree is *Gaya Lyallii* Bak. f. whose masses of pure white flowers are a feature of some of the gardens in favored spots in Great Britain. Two Monocotyledons (*Cordyline australis* Hook. f. and *C. indivisa* Steud.) are most useful garden plants in California, the Mediterranean region and even thrive in Cornwall and in the Scilly Isles. In the southern hemisphere and notably in Australia and South Africa there are a great number of shrubs and small trees of great value to the gardens of warm sunny northern lands but for forest planting very few southern trees are likely to be of value north of the Tropic of Cancer.

GEORGE ROGERS HALL, LOVER OF PLANTS

JAMES M. HOWE, JR.

(The Journal is glad of the opportunity to print this account of the life of Dr. Hall written by his grandson, for little is known at least to this generation of the man who first sent Japanese plants direct to the United States and to whom American gardens owe the introduction of the Japanese Yew, the most valuable plant brought to the United States from Japan, *Malus Halliana Parkmanii*, *Abies homolepis*, *Thujopsis dolobrata*, *Magnolia stellata* and *Lilium auratum*. To Mr. Howe's paper is added an appendix containing a list of the plants known to have been first introduced into this country by Dr. Hall, and an account of the important collection of trees which he planted on his farm in Bristol, R. I., which now contains the largest specimens in the United States of a few species.—ED.)

GEORGE ROGERS HALL was born in Bristol, R. I. on March, 1820.

Dr. Hall's farm, which was purchased by his father in 1830 and on which he spent many years of his life, is situated on the westerly side of the main road connecting the towns of Warren and Bristol. It consists of a level area along the road, a rocky slope, and finally more level land extending down to the waters of Narragansett Bay. The situation is an unusually fine one. The old farmhouse, however, is set near the highroad and does not command any special outlook. A lane runs back from the street and continues down to the shore, dividing the farm into two nearly equal parts.

Hall went to Trinity College, Hartford, graduating in 1842, and from there to the Harvard Medical School, matriculating with the class of 1846.

After graduation, young Dr. Hall decided to embark for China, sailing under the auspices of members of the King family of Newport, who seem to have been friends of his father. In China Dr. Hall met Edward Cunningham and David Oakes Clark, both of Milton, Massachusetts, and formed with them the close friendship which lasted all their lives.

Dr. Hall commenced practice in the foreign settlement of Shanghai, built a house there and in the year 1850 came back to America to marry Helen Beal, daughter of Thomas Prince Beal, a lawyer of Kingston, Mass. Mrs. Hall returned with him to his China home. Here three sons were born—Chandler Prince 1851, Edward Cunningham 1853, George Rogers 1854.

Mrs. Hall returned to America with her three small sons in 1854, the youngest, George, falling ill and dying on the voyage. Mrs. Hall's letters, written at this time and during her stay in China, are full of charm and of the warmest affection for the husband whom she was now leaving behind.

Soon after his wife's departure, Dr. Hall gave up the active practice of medicine and joined with his friend, Cunningham, in the more lucrative business of trade. Dr. Hall made a number of voyages on Cunningham's schooner yacht, the Halcyon, and on one occasion had a serious brush with pirates, who at that time infested the China seas. A voyage was made to Japan in 1855 before the formal opening of that country to trade.

During this period, Dr. Hall and Mr. Cunningham accumulated a good deal of money, through trade and through certain favorable conditions in regard to the rates of exchange of gold and silver. What was of more interest, however, was the fact that these two men had good taste and their eyes open to the opportunity of collecting some of the finest and rarest of Chinese and Japanese curios, bronzes, lacquer work and ebony. On his several trips to America, Dr. Hall brought back with him, as did Cunningham and Clark, large numbers of now priceless objects of art Dr. Hall's great interest in horticulture also began to assert itself at this time, and he began to send specimens of plants to America, some of which now bear his name, and others, though probably of his introduction, which are not now credited to him. Unfortunately, Dr. Hall kept no record of his experiences so that little is known of the disposition of his plants. Many were taken by Dr. Hall himself to Bristol and planted there, and to-day form an interesting and unique collection, highly prized by some of the leading plant lovers of the country.

In 1861, or early in 1862 Dr. Hall returned to America and rejoined his family. Twin daughters, Elizabeth and Helen Beal were born at Bristol in 1864 and in the same year the devoted wife died. Dr. Hall made one more trip to Japan in 1875, a previous voyage undertaken with Mrs. Hall, having been given up on account of sickness when the couple reached Aspinwal.

The two sons entered Harvard College. Chandler remained only a year, and then following in his father's footsteps, went to Japan. There he lived the remainder of his life. He died of smallpox in Kobe in 1897. Edward took a prominent place in his class (1876) and became its First Marshall. He showed great interest in athletics, being a member of one of the first football teams which played Yale. After graduation, he went to the West and has remained there ever since, being engaged in cattle ranching. His present location (1923) is near the Missouri River in eastern Montana, some 35 miles from Jordan, Dawson Co., and 130 miles from the railroad at Miles City.

In the sixties, Dr. Hall began to look about for a new place in which to settle in America. He considered California, and Southboro, Mass. Mrs. Hall would have preferred a conventional life in Boston and her husband's return to active practive, but this did not suit him, and no change from Bristol was made, however, until Dr. Hall made his first trip to the south in 1865. He lived for a season or two near Rome, Georgia, but nothing is remembered of this period, save that he was accustomed to hang out the Union flag from his house, only to have it repeatedly torn down. His next move was to Jacksonville, Florida, where he built a house, "Narragansett," here he passed many winters.

Benjamin Hall, his father, died in 1872 and Dr. Hall thus came into possession of the farm at Bristol. The rest of the doctor's life was spent in Bristol and in Florida with the exception of the short trip to Japan in 1875.

Dr. Hall's life was now wrapped up in the care and cultivation of his plants. One of the best fields at Bristol was chosen as a suitable location for the planting of a great evergreen border and here were set out some fifty or more varieties of trees. In the garden back of the house had been planted and still stands the original Japanese Yew—*Taxus cuspidata*. A great collection of trees, shrubs, fruit trees, lilies and perennial plants are dimly remembered by friends who knew the doctor in those days. Of these many have disappeared, but some of the Conifers and a few of the deciduous leaved trees to-day are among the finest specimens of their kind in the country.

In the great border there now remain several large specimens of *Abies firma*, *Abies cilicica*, *Abies cephalonica*, *Picea pungens*, and *Picea polita*. There are a large *Picea jezoensis*, an Umbrella Pine (*Sciadopitys verticillata*) a Thujopsis, several Yews and a fine *Abies homolepis*. There are also a number of handsome specimens of Thuya of different varieties, several dwarf Spruces, Retinosporas in variety and especially Retinospora or *Chamaecyparis obtusa*, which thrives exceedingly and has seeded itself in many places.

In the deciduous section the important tree is *Zelkova serrata*, the Japanese Elm, a magnificent tree thriving exceedingly in this climate, but as yet little known. The delicate arching branches of the Zelkowa, its fine, smooth brown bark, and its strong habit of growth should certainly commend it for more general planting. The tree bears heavy crops of seed, which germinate with great readiness, and the ground about the older specimens is generally thickly overgrown with seedlings. Zelkovas planted in Milton by Dr. Hall's daughter and by the author of this article have made rapid and healthy growth.

Another interesting and rare tree planted at Bristol by Dr. Hall is *Phellodendron Lavallei*, of which there is but one specimen. The bark, though rough, is less corklike than that of *Phellodendron amurense*, and to the uninitiated the tree might be mistaken for an Ash.

Other more common trees are *Ginkgo biloba*, Maples including the dwarf Japan varieties, the Kentucky Coffee-tree (*Gymnocladus dioeca*), the Gums, (*Liquidambar Styraciflua*, and *Nyssa sylvatica*), European Beech (*Fagus sylvatica*), Yellowood (*Cladrastis lutea*), Honey Locust (*Gleditsia triacanthos*), Horsechestnut (*Aesculus Hippocastanum*) of which there is one showing a variegation in the foliage, Pyramidal Oak (*Quercus robur* var. *fastigiata*), Tulip-tree (*Liriodendron Tulipifera*).

A fine specimen of Hall's Magnolia (*M. stellata rosea*) still remains in a sheltered spot, and is a glory in the early spring with its profuse clothing of long pinkish white and fragrant blossoms.

Hall's Flowering Apple (*Malus Halliana*) often called the Parkman Crab since Dr. Hall sent the first specimens to Mr. Parkman, may still be seen, though there is no longer a good specimen of this tree.

Hall's Honeysuckle (*Lonicera japonica* var. *Halliana*) runs rampant under the trees and has done much harm in the past through climbing

over the Conifers. Evonymus, probably *Evonymus patens*, grows freely as a shrub or as a ground cover according to its location in sun or shade, and there is too, a fine hedge of this interesting plant.

Hall's Amaryllis (*Lycoris squamigera*) is naturalized in a number of places. This interesting plant sends up in the Spring its long leaves flatly rounded at the ends. Later the foliage disappears and is followed in August by clusters of beautiful, fragrant pink flowers.

In another location on the farm there are several large specimens of the Japanese Walnut (*Juglans Sieboldiana*) producing edible nuts in great round dark cases.

A delicate shrub flowering early in the Spring, *Corylopsis pauciflora* still remains in the old garden of Dr. Hall's house, and there is a hardy Orange (*Poncirus trifoliata*) which occasionally bears fruit. There is also a Loquat. The crowning glory of all, however, is the magnificent great Japanese Yew (*Taxus cuspidata* var. *nana*) which stands in a sheltered spot in the garden. This tree is believed to be the original Japanese Yew brought to America. At the base there is a short trunk twelve inches diameter and from this point the rough-barked branches stretch out like octopus feelers in every direction. The specimen was well clothed throughout until a few years ago when lightening struck a neighboring tree and also killed several branches on one side of the Yew. The heavy crop of bright red berries borne in the fall, when seen against the background of dark evergreen foliage, gives the tree a striking appearance. The hardy qualities of this yew combined with its tolerance for shade are now making it a popular plant for general garden planting.

Dr. Hall's life in Florida cannot be very clearly traced. He spent a number of winters in his Jacksonville house and then became interested in a development scheme at Fort George Island at the mouth of the St. John's River, twenty-six miles below Jacksonville. Here a hotel and four or five cottage were built by Dr. Hall and several associates, and the settlement was run with considerable success for four of five years. Then one of the chief supporters of the scheme dropped out, the hotel burned down just at the time when the insurance had lapsed, a storm destroyed a smaller hotel which the company had erected on the beach, and practically all the money invested was lost. Unfortunately, Dr. Hall had little judgment about financial matters, so that this collapse, combined with an even more foolish venture with a gold mine in Georgia, left him with very scanty funds. To complete the misfortune, his Orange-grove was destroyed by the great freeze of 1880 81 and was a total loss.[1] The farm at Bristol was mortgaged, most of the Florida property was sold, and for the remainder of his life Dr. Hall lived largely on the proceeds of the sale of his valuable Oriental curios. Some of the pieces were bought for the Boston Art Museum and others by private individuals. Fortunately a considerable number were kept and now belong to his daughters.

[1] For a graphic description of the great Florida freeze, see Helen Harcourt's "Florida Fruit, How to Raise Them."

Those who remember Dr. Hall at Fort George describe him as a man of great charm and refinement. His house or rather the single room and ell, which was all that he ever built, was a veritable museum of bronzes, china and curios and was regarded with awe and wonder by those who were privileged to visit it. The grounds were a bower of all sorts of tropical plants, lilies of many kinds flourished, especially in the neighborhood of a little pond at the rear. All this has long since disappeared and the writer in a recent trip to the island could find nothing unusual in the way of plants save a Magnolia-tree of great size and some fine Live Oaks. The house or room, however, remains, though moved from its original location, and now forms part of the dwelling of Mrs. Manning. Two rows of massive Live Oaks, planted across the back of Dr. Hall's place, and extending to the land of neighbors, bear impressive witness to the effect to establish windbreaks for the Orange-groves, and to protect them from the disastrous frosts.

Dr. Hall contemplated at one time setting out an orchard of Chinese Sand Pears at Fort George. Helen Harcourt in her excellent book "Florida Fruits, How to Raise Them" speaks of the great results to be expected from the planting of this fruit in Florida. She also mentions the Satsuma Orange as having been originally planted at Fort George, we may presume by Dr. Hall. This Orange is believed today to have considerable possibilities in the colder sections of Florida. Another introduction of Dr. Hall's was the Celestial Fig, plants of which still thrive in the neighborhood of the house.

Fort George Island is today a beautiful and romantic spot. The land is at a considerable elevation above the water and is partly surrounded by salt marshes. Great Live Oak-trees, intermingled with Cabbage Palmettos, and a few exceptionally large Pines shade the ground. A number of miles of shell road make all parts of the island accessible. Beds of oysters line the shore in some places and there is a fine sand beach. The island is reached by crossing the St. John's River in a small boat from Mayport and landing at the little settlement of Pilot Town.

In spite of misfortune Dr. Hall continued to visit Florida in the winters, his last two trips being to Lake Worth. The writer, a small boy at the time, remembers the doctor at Bristol. At this period he was an old man with pointed white beard and rather a gruff manner. On returning from his morning visit to his garden he was accustomed to have a rose in the corner of his mouth, a habit which the older inhabitants of Fort George also recall. On one occasion a grapefruit or pomello, as Dr. Hall called it, was brought out at Bristol and at another time there was an alligator pear. Neither of these fruits at this time had been generally introduced but the doctor had brought them with him from Florida. Dr. Hall occasionally visited his daughter, Mrs. Howe, at her place Brush Hill in Milton, Mass., and here he came for the last time in the autumn of 1899. On December 24, after a short illness George Rogers Hall, then in his eightieth year passed away.

APPENDIX

PLANTS SENT BY DR. HALL TO THE UNITED STATES

THE time of Dr. Hall's visits to Japan was one of great activity in plant introduction following as it did on the heels the opening of the country to foreign trade. In 1856 von Siebold & Co. of Leyden issued a catalogue offering for sale a great many newly introduced Japanese plants. The Russian botanist, Maximowicz, traveled in Japan from 1859–64, John Gould Veitch was there in 1860 from July until late November and Robert Fortune from October 1860 until the end of the year, and again in 1861 from May until the end of July. These collectors sent a variety of plants to Europe where they were promptly placed in the hands of expert cultivators and by Lindley and other botanists named and recorded in current literature without loss of time. Such favorable circumstances did not attend Dr. Hall's introductions. His first consignment was brought to Boston by Mr. F. Gordon Dexter; it arrived in 1861 and was given to Francis Parkman. The second consignment Dr. Hall brought himself and handed over to the Parson Company at Flushing, Long Island, March 1862. These plants seem to have been obtained mainly if not solely from Japanese gardens and include a number with variegated foliage. Just how many species and varieties of plants Hall introduced will never be accurately known for unfortunately no botanist of the time examined his collections. By diligent search of literature and of the records of the Massachusetts Horticultural Society it has been possible to compile the following list and it seems probable that all the plants named were first introduced into America by Dr. Hall. Also it appears almost certain that such valuable plants as the two Magnolias (*Magnolia stellata* and *M. kobus*), Hall's Crabapple (*Malus Halliana* f. *Parkmanii*), his Honeysuckle and its variegated form (*L. japonica* var. *Halliana* and f. *aureo-reticulata*), the evergreen *Evonymus patens*, the popular *Hydrangea paniculata* f. *grandiflora*, *Rhododendron brachycarpum*, *Hypericum patulum*, *Cornus kousa*, the double-flowered *Wistaria floribunda* f. *violaceo-plena* and the bulbous *Lycoris squamigera* were introduced into America by Hall before they were in Europe. The bulbs of *Lilium auratum* sent by Hall were exhibited in flower by Mr. Parkman as a "New Lily" but without a name before the Massachusetts Horticultural Society on July 12, 1862 just ten days after Messrs. Veitch had exhibited this Lily in London and Lindley had given it its name.

PLANTS FIRST SENT TO AMERICA FROM JAPAN IN 1861 BY DR. HALL AND GIVEN BY MR. F. GORDON DEXTER TO FRANCIS PARKMAN

Ginkgo biloba f. variegata Carr.
Thujopsis dolabrata S. & Z.
Thujopsis dolabrata f. variegata Fort.
Sciadopitys verticillata f. variegata Gord.
Cryptomeria japonica f. variegata Hort.
Chamaecyparis pisifera S. & Z.

Juniperus chinensis f. japonica Vilm.
Lilium auratum Lindl.
Lilium speciosum (2 new forms).
Hosta (Funkia) plantaginea var. grandiflora Hort.
Lycoris squamigera Maxim.
Malus Halliana f. Parkmanii Rehd.
Wistaria floribunda f. violaceo-plena Rehd. & Wils.
Hypericum patulum Thunb.
Cornus kousa f. variegata Hort.
Rhododendron brachycarpum D. Don.
Lomicera japonica f. aureo-reticulata Nichols.
Hibiscus syriacus (a form having yellow flowers with a purple eye)

PLANTS HANDED OVER BY DR. HALL TO PARSON & CO., FLUSHING, LONG ISLAND, MARCH 1862.

Taxus cuspidata var. nana Rehd.
Pinus densiflora S. & Z. (seeds)
Pinus densiflora f. aurea Mayr.
Picea polita Carr.
Picea jezoensis Carr.
Abies firma S. & Z. (seeds)
Sciadopitys verticillata S. & Z. (seeds)
Cryptomeria japonica var. elegans Mast.
Chamaecyparis obtusa S. & Z.
Chamaecyparis pisifera (10 garden forms of)
Juniperus procumbens Sieb.
Magnolia kobus DC.
Magnolia stellata Maxim.
Evonymus patens Rehd.
Wistaria floribunda DC. (seeds)
Wistaria floribunda f. alba Rehd. & Wils.
Wistaria floribunda f. variegata Rehd. & Wils.
Wistaria floribunda var. macrobotrys Rehd. & Wils.
Hovenia dulcis Thunb.
Acer palmatum Thunb.
Acer palmatum f. sanguineum Carr.
Acer palmatum f. sanguineum variegatum Hort.
Acer palmatum f. ornatum Carr.
Acer palmatum f. Frederici-Guilelmi Carr.
Acer palmatum f. roseo-marginatum Schwerin.
Deutzia crenata f. plena Rehd.
Hydrangea paniculata f. grandiflora Sieb.
Aucuba japonica Thunb. (seeds)
Diervilla japonica f. alba Mak.
Diervilla japonica var. hortensis Rehd.
Lonicera japonica var. Halliana Nichols.

Zelkova serrata (plants & seeds).
Quercus dentata Thunb.
Quercus dentata var. pinnatifida Mats.
Castanea crenata S. & Z.

In addition to these we are told (Horticulturist, XVII. 186 [1862] there were some fine new Conifers without a name; fifteen double-flowered Cherries, one with flowers as large as a rose; five new Hibiscus; forty-five Maples, many of them variegated and some of them as drooping in their branches as the Weeping Ash; four new sorts of Diervilla, some with variegated foliage; a variegated Elaeagnus; a new Berberis; a variegated, a dwarf and a giant Bamboo; seven new Honeysuckles; six new Japanese Lilies; eight new Columbines and other herbaceous plants; six new sorts of Chrysanthemums of superior beauty and a new Fern. Among the seeds were those of the Japanese Persimmon, of a variegated Camphor-tree, of a tree with variegated leaves and growing like the Poplar, of another tree with variegated leaves and yellow Hibiscus-like flowers, of a new Weeping tree with white flowers, of a new Primrose with flowers produced in an upright cluster the shape of a pagoda, and of a large number of other trees and shrubs unlike anything we have here and possessing great beauty. Although no mention is made of it Dr. Hall must have introduced *Phellodendron Lavallei* Dode for in his garden at Warren, Rhode Island, there is a large specimen with a trunk 3½ feet in girth.

SOME OF THE TREES IN DR. HALL'S PLANTATION ON HIS FARM IN BRISTOL, RHODE ISLAND

On his estate at Bristol Neck, near Warren, Rhode Island, there are growing some of the oldest and finest Japanese Conifers in the eastern States. Dr. Hall probably planted most of these and other trees in 1872 or later. These measurements were made in September 1919. Among the more noteworthy may be mentioned:—

Taxus cuspidata var. nana—26 feet tall and 130 feet around, (probably planted before 1872).
Pinus densiflora—50 feet tall, 6 feet in girth of trunk
Picea jezoensis—65 feet tall, 6½ feet in girth of trunk.
Picea polita—55 feet tall, 4 feet in girth of trunk.
Abies firma—90 feet tall, 7 feet in girth of trunk.
Chamaecyparis obtusa—55 feet tall, 3 feet in girth of trunk.
Zelkova serrata—75 feet tall, 6 feet in girth of trunk.
Phellodendron Lavallei—35 feet tall, 3½ feet in girth of trunk.

There is also a healthy specimen of *Abies homolepis* S. & Z. 40 feet tall which was planted at a later date. Of Conifers other than Japanese Dr. Hall's old garden boasts fine specimens of *Picea pungens* Engelm., 85 feet tall, *Abies cephalonica* Link, 85 feet tall, and *Abies cilicica* Carr., also about 80 feet tall.

NOTES ON NORTH AMERICAN TREES, XI[1]

C. S. Sargent

NEW SPECIES OF CRATAEGUS

Crataegus Stevensiana (§ Crus-galli), n. sp.

Leaves obovate, rounded at the broad apex, gradually narrowed and cuneate at base, coarsely doubly serrate above the middle with acute teeth, subcoriaceous, dark green and lustrous on the upper surface, dull and paler on the lower surface, 3–4 cm. long and 2–2.5 cm. wide, with a thin midrib and slender obscure primary veins; petioles slender, glabrous, narrow-winged nearly to the middle by the decurrent base of the leaf blade, 7–10 mm. in length; leaves on vigorous leading shoots suborbicular, rounded or minutely pointed at apex, broad-cuneate at base, finely serrate above the middle, 3–3.5 cm. long and wide, their petioles broadly wing-margined at apex, 5–7 mm. in length. Flowers opening about the middle of May, 1.2 cm. in diameter, on slender pedicels in thin-branched glabrous mostly 10–15-flowered corymbs, their bracts and bractlets linear, scarious, caducous; calyx-tube narrow-obconic, glabrous, the lobes gradually narrowed from a wide base, acuminate, coarsely serrate below the middle, glabrous on the outer surface, slightly villose on the inner surface; stamens 10, anthers yellow, styles 2 or 3. Fruit ripening late in September, on slender pedicels, in drooping few-fruited clusters, short-oblong to slightly obovoid, green tinged with red, 5–7 mm. long, 4–5 mm. in diameter; calyx little enlarged, with a wide cavity pointed in the bottom; flesh thin and dry; nutlets 2 or 3, rounded at the ends, only slightly ridged on the back, 4–5 mm. long and 3–4 mm. wide, with a dark hypostyle extending to the middle.

An intricately branched shrub 1.5–3 m. high, with dark slightly scaly bark and slender straight or zigzag glabrous branchlets, chestnut-brown and lustrous during their first and second years, becoming dull gray-brown and armed with numerous stout nearly straight dark chestnut-brown spines 3–5 cm. in length.

Kansas. Wilson County, thickets along small streams and on rocky hillsides, Neodisha, *E. J. Palmer*, No. 21158, May 5, 1922, Nos. 21562 (type), 21374, May 22, 1922, No. 22042, September 19, 1922.

Oklahoma. Greer County, "occasional along creek in the mountains," near Granite, *G. W. Stevens*, No. 2891, October 7, 1913. Kiowa County, among rocks on granite hills, near Snyder, *E. J. Palmer*, No. 12586, July 18, 1917, No. 13075 October 26, 1917.

This Kansas and Oklahoma species appears most closely related to *Crataegus jasperensis* Sarg. of southwestern Missouri from which it differs in its more coriaceous leaves rounded and not pointed at apex, smaller

[1] For part X see vol. III. p. 182.

flowers with 10, not 20 stamens, and smaller fruit which is the smallest of all the described species in the Crus-galli group. I take pleasure in joining with this species the name of Mr. G. W., Stevens who first collected it is 1913 during his explorations of the flora of Oklahoma.

Crataegus franklinensis (§ Pruinosae), n. sp.

Leaves ovate and rounded or elliptic and cuneate at base, acuminate at apex, slightly lobed above the middle with broad acuminate lobes, sharply doubly serrate often nearly to the base, thin, glabrous, dark yellow green on the upper surface, slightly paler on the lower surface, 4–4.5 cm. long, 2.5–3.5 cm. wide, with a prominent midrib and slender primary veins; petioles slender, occasionally glandular with small scattered glands, glabrous, 2–2.5 cm. in length; leaves on vigorous leading shoots broad-ovate, broad-cuneate to rounded at base, slightly decurrent on the stout petiole, up to 5 cm. long and wide. Flowers opening from the 15th to the 20th of May, about 1.4 cm. in diameter, on slender pedicels, in small compact mostly 5-flowered glabrous corymbs; calyx-tube narrow-obconic, glabrous, the lobes gradually narrowed from a wide base, short, acuminate, entire or furnished with an occasional tooth, glabrous; stamens 5 or 6; anthers pale pink; styles 3–5. Fruit ripening the end of September, slightly obovoid to subglobose, dark red, 8–10 mm. in diameter, the calyx little enlarged, nearly sessile, with a wide deep cavity narrowed and rounded in the bottom; flesh thin and hard; nutlets 3–5, rounded at the ends, rather broader at apex, than at base, prominently ridged on the back, 6–7 mm. long and 4–5 mm. wide, the narrow hypostyle extending to below the middle.

A shrub with several stems, erect gray-green branches, slender nearly straight glabrous branchlets, orange-brown early in their first season, becoming dark chestnut-brown and armed with slender nearly straight spines 2–3 cm. in length.

OHIO. Franklin County, north of Columbus between Flint and Glenmary, *R. E. Horsey*, No. 236 (type), May 18, 1914, September 22, 1914, October 23, 1912.

This plant in general appearance resembles *Crataegus ovatifolia* Sarg. from Coopers Plain, New York, but is distinguished from that species by the absence of the short white hairs on the upper surface of the young leaves. These hairs are not common on the species of the Pruinosae but when they do occur furnish one of the best characters for distinguishing the species in early spring. They are found on the young leaves of all the species of the Silvicolae (Medioximae) which have been examined and furnish with the sessile calyx of the fruit the characters by which the plants of this group can be distinguished from those of the Pruinosae. The entire absence of these hairs from the leaves of *Crataegus franklinensis* would place it with the Pruinosae, although the fruit with its almost sessile calyx suggests that it might also be placed in the Silvicolae.

Crataegus Milleri (§ Pruinosae), n. sp.

Leaves ovate, rounded or cuneate at base, acute or acuminate at apex, slightly lobed above the middle with acuminate lobes, and sharply often doubly serrate; tinged with red and roughened above by short white hairs when they unfold, soon glabrous and at maturity thin, bluish green, 3–4 cm. long and 2-2.5 cm. wide, with a slender midrib and primary veins; petioles slender, glandular toward the apex, glabrous, 1.5–2 cm. in length; leaves on vigorous leading shoots ovate, acuminate, rounded at the wide base, more deeply lobed and more coarsely serrate, often 6–9 cm. long and 5.5–6.5 cm. wide, with stout deeply grooved petioles 2.5–3 cm. in length. Flowers opening at the end of May or early in June, about 1.5 cm. in diameter, on slender pedicels in mostly 10–15-flowered broad lax glabrous corymbs, their bracts and bractlets conspicuous, glandular-serrate, soon deciduous; calyx-tube broad-obconic, glabrous, the lobes gradually narrowed from the base, slender, acuminate, entire or obscurely serrate below the middle, glabrous; stamens 7–10; anthers pink to rose color or maroon; styles 3–5. Fruit ripening early in October, on long slender pedicels, obovoid, gradually narrowed from above the middle to the acute base, green and covered with a glaucous bloom, becoming red just before falling, 1.5 cm. long and 8–10 mm. in diameter, the calyx little enlarged, with a short tube, spreading and reflexed lobes and a wide shallow cavity; flesh thin, dry and mealy; nutlets 3–5 rounded at the ends, broader at apex than at base, prominently ridged on the back, about 7 mm. long and 5 or 6 cm. wide, the narrow pale hypostyle extending nearly to the base.

A shrub 3–4 m. high, with thick erect branches and stout slightly zigzag glabrous branchlets dark reddish brown when they first appear, becoming lighter before the end of their first year, and armed with numerous stout nearly straight light chestnut-brown spines 3–6 cm. in length.

Pennsylvania. Erie County, Cliffs of 4-mile Creek, Erie, *R. E. Horsey* and *John Miller*, No. 76, September 23, 1916, *R. E. Horsey*, No. 76, May 29, 1917, *John Miller*, No. 76, June 11, 1917; Kearsarge, *R. E. Horsey* and *John Miller*, Nos. 80 (type), 81, 82, 83, 87, September 24, 1916, May 31, 1819, *John Miller*, Nos. 80, 81, 82, 83, June 11, 1917.

This species is most closely related to *C. oratifolia* from Cooper's Plains, New York, from which it differs in its more sharply lobed leaves often rounded at base, smaller flowers with entire or nearly entire calyx-lobes, and fruit more gradually narrowed at base. It differs from *C. incisa* Sarg. from Stratford, Connecticut, a species with leaves cuneate at base, about ten stamens and obovoid fruit, in its smaller less deeply lobed leaves covered when they first appear with short white hairs, smaller flowers in more numerous-flowered corymbs and fruit more gradually narrowed at base. In shape the fruit resembles that of *C. levis* Sarg. from Litchfield, Connecticut, but the nutlets are narrower, acute at the ends and less prominently ridged on the back. The leaves of that species

too, are less lobed and the flowers with more glandular-serrate calyx-lobes are larger in few-flowered corymbs.

Crataegus iterata (§ Silvicolae), nov. nom.

Crataegus seclusa Sarg. in Bull. N. Y. State Mus. clxvii. 89, September 1913, not *Crataegus seclusa* Sarg. in Trees and Shrubs, II. 239, August, 1913.

By an oversight the name seclusa was unfortunately given by me in 1913 to a Pruinosae species from southern Missouri, published in August, and to a Silvicolae species from the Hemlock Lake region near Rochester, N. Y., published in September. The new specific name, from *itero*, now proposed for the New York species is in allusion to this repetition of names.

Crataegus Putnamiana (§ Coccineae), n. sp.

Leaves ovate, acuminate at apex, cordate or rounded at base, laterally lobed with short acuminate lobes, and sharply doubly serrate to the base with acuminate gland-tipped teeth; when they unfold tinged with red, and covered above by short white caducous hairs, and at maturity thin, glabrous, yellow-green on the upper surface, paler on the lower surface, 5–7 cm. long, and 4–6 cm. wide, and on vigorous leading shoots up to 8 cm. long and 7 cm. wide, with a slender prominent midrib and primary veins; petioles slender, glandular, sparingly villose with short white hairs, becoming glabrous, 2.5–4 cm. in length. Flowers opening from the 10th to the middle of May, about 1.5 cm. in diameter, on slender pedicels in 5 or 6-flowered glabrous corymbs; calyx-tube narrow-obconic, glabrous, the lobes narrow, long-acuminate, laciniately glandular-serrate, glabrous on the outer surface, sparingly villose on the inner surface; stamens 16–20; anthers dark red; styles 4 or 5. Fruit ripening early in October, on elongated pedicels in drooping clusters, depressed-globose, slightly angled, green, turning red, punctate, 1.5 cm. in diameter; calyx enlarged with a wide shallow cavity, broad in the bottom and spreading closely appressed lobes; nutlets 4 or 5, rounded at apex, acute at base, prominently but irregularly ridged on the back, 6 or 7 mm. long, 3 or 4 mm. wide, the narrow brown hypostyle extending to the middle.

A shrub up to 5 m. high, with erect stems covered with light gray bark, and stout glabrous zigzag branchlets light chestnut-brown to olive green when they first appear, chestnut-brown and lustrous in their second year, and armed with stout straight spines 3–3.5 cm. in length

Ohio. Washington County, common near Marietta, *R. E. Horsey*, No. 591 (type), September 27, 1916, May 20, 1917.

Of the Coccineae only three species with glabrous corymbs and twenty stamens and red, pink or rose-colored anthers have been described, *C. contigua* Sarg. from Stockbridge, Vermont, *C. magniflora* Sarg. from northern Illinois and Ganonoque, Ontario, and *C. splendida* Sarg. from Sarnia, Ontario. From these species *C. Putnamiana* differs in its cordate leaves with villose petioles, and in its larger depressed-globose fruit, that of the related species being short-oblong to obovoid. I have associated

with this distinct and handsome shrub the name of General Rufus Putnam who in 1788 laid out Marietta, the oldest town in Ohio.

Crataegus illecebrosa (§ Coccineae), n. sp.

Leaves ovate, acuminate at apex, abruptly cuneate or rounded at base, divided usually only above the middle into short acuminate lobes and sharply doubly serrate occasionally to the base with straight acuminate teeth; fully grown when the flowers open and then covered above with short soft hairs and pale and glabrous below, and at maturity thin, yellow-green, glabrous, 6 cm. long and 5 cm. wide, with a thin midrib and primary veins; petioles slender, slightly grooved, glabrous, 2.5–3 cm. in length; leaves on vigorous leading shoots rounded at base, more deeply divided into acuminate lobes, their petioles conspicuously glandular. Flowers opening early in June, on slender glabrous pedicels, in mostly 10–12-flowered globose corymbs; calyx-tube narrow-oboconic, glabrous, the lobes separated by wide sinuses, slender, acuminate, irregularly glandular-dentate or entire, glabrous on the outer surface, slightly villose on the inner surface; stamens 20–25; anthers dark rose color or red; styles 3–5. Fruit ripening late in October, obovoid, slightly mammillate at the narrow base, crimson, marked by minute pale dots, 2 cm. long and 1.5 cm. wide, the calyx little enlarged with a narrow deep cavity pointed in the bottom and persistent spreading or erect lobes; flesh thick soft and succulent; nutlets 3–5 rounded at the ends, narrower at base than at apex, rounded and slightly grooved or prominently ridged on the back, 7–8 mm. long and 3–5 mm. wide.

An arborescent shrub about 4 m. high, with ascending branches and slender nearly straight branchlets dark green and marked by numerous pale lenticels when they first appear, becoming light red during their first season and ashy gray the following year and armed with occasional nearly straight slender spines 2.5–3 cm. in length.

Ontario. Pastures in heavy clay soil about two miles northeast of Kingston, *J. Dunbar*, Nos. 110 (type), and 102, October 19, 1911, and June, 6, 1912.

This species appears to be most closely related to *C. magniflora* Sarg. from northern Illinois, from which it differs in the soft not rigid hairs on the upper surface of the young leaves which later in the season is not scabrate like that of *C. magniflora*, in the less serrate calyx-lobes, and in the softness of the flesh of the fruit which is unusually succulent in a species of this group.

Crataegus mansfieldensis (§ Rotundifoliae), n. sp.

Leaves ovate, acuminate, rounded or cuneate at base, laterally lobed above the middle with short acuminate lobes, and finely doubly serrate with short glands, covered above with short white hairs and villose below along the midrib and veins, and at maturity thin, dark yellow-green, smooth and glabrous on the upper surface, pale, scabrate and still slightly villose on the lower surface along the thin midrib and slender primary

veins, 5–7 cm. long and 3.5–4.5 cm. wide; petioles slender, villose, 2–3 cm. in length; leaves on vigorous leading shoots ovate, acuminate, rounded cuneate or truncate at base, more deeply lobed with acuminate lobes pointing toward the apex of the leaf, 6.5–8 cm. long and 6–7 cm. wide, with petioles 3.5–4 cm. in length. Flowers opening from the 15th to the 25th of May, about 1.5 cm. in diameter, on long villose pedicels, in wide slightly villose mostly 6- or 7-flowered corymbs; calyx-tube narrow-obconic, glabrous, the lobes generally narrowed from a wide base, acuminate, entire or furnished with occasional teeth toward the apex; stamens 20; anthers white, often tinged with pink; styles 3–5. Fruit ripening in October, on slender drooping pedicels, broad-obovoid, subglobose, dark red, 1–1.2 cm. long and 8–10 mm. in diameter; calyx little enlarged, with a wide deep cavity pointed in the bottom and spreading closely appressed persistent lobes; flesh thin, dry and mealy; nutlets 3 or 5, rounded at the ends, broader at apex than at base, rounded and only slightly ridged on the back, 8 or 9 mm. long and 4 or 5 mm. wide, the narrow dark hypostyle extending nearly to the middle. .

A shrub or a tree up to 4 m. in height, with a short trunk covered with ashy gray bark, horizontal and drooping branches, and slender nearly straight branchlets orange-green and slightly villose when they first appear, soon glabrous, light red-brown in their second season, becoming light gray-brown, and armed with occasional slender nearly straight spines 2–3 cm. in length.

OHIO. Richmond County, near Mansfield, *R. E. Horsey*, No. 384, May 21, 1915, September 26, 1915 (type), *Wilkinson and Horsey*, May 21, 1915; *R. E. Horsey*, May 25 and October 1, 1916.

The general appearance of this plant would indicate that it could be well placed with the species of the Asperifoliae Group, but the entire absence of depressions on the inner faces of the nutlets on which this Group was established would seem to require another disposition for it. The other group with which it could be put is the Rotundifoliae. In this group only five species with villose or pubescent corymbs, 20 stamens and yellow or white anthers have been described. From all of these the Mansfield plant differs in the shape of the leaves which resemble those of *C. asperifolia* Sarg. a species of the Anomalae. Of the five species of the Rotundifoliae with 20 stamens, yellow or white anthers and pubescent corymbs only *C. Oakesiana* Eggleston from Vermont has obovoid fruit, with soft succulent flesh but this is nearly twice as large as that of the Ohio plant. Mr. Horsey's material is not very good and further study of the tree which are now growing in the Arboretum will perhaps show that this species should be referred to another group.

Crataegus pagensis (§ Intricatae), n. sp.

Leaves ovate to slightly obovate or oval, rounded and short-pointed or acute at apex, concave-cuneate at base, occasionally and slightly lobed above the middle and doubly serrate with short broad acute teeth; tinged

with red when they unfold, and slightly villose on the upper side of the midrib early in the season, at maturity thin, glabrous, dark yellow-green on the upper surface, paler on the lower surface, 4–5 cm. long and 3.5–4.5 cm. wide, with a prominent midrib and slender primary veins; petioles slender, wing-margined at apex by the decurrent blade of the leaf, 1–1.5 cm. in length; leaves on vigorous leading shoots ovate to suborbicular, often laterally lobed with acuminate lobes, as seen not more than 4.5 cm. long and 3.5–4 cm. wide. Flowers appearing from the middle to the end of April, about 1.5 cm. in diameter, on slender pedicels in glabrous compact mostly 4- or 5-flowered corymbs, the bracts and bractlets leaf-like, oblong-ovate, acuminate, glandular, early deciduous; calyx-tube broad- obconic, glabrous, the lobes gradually narrowed from a wide base, short, acute, laciniately glandular-serrate, glabrous on the outer surface, sparingly villose on the inner surface; stamens 10; anthers rose-color; styles 3 or 4. Fruit ripening the end of September, on short erect or spreading pedicels, in few-fruited clusters, short-oblong to slightly obovoid, dull orange-brown, about 1 cm. long and broad, the calyx little enlarged with spreading lobes, and a deep cavity pointed in the bottom; flesh very thin and dry; nutlets 3 or 4, gradually narrowed and rounded at the ends, rather broader at base than at apex, only slightly ridged on the back, 7 or 8 mm. long and 5 or 6 mm. wide, the dark conspicuous hypostyle extending for about a third of their length.

A shrub 2–3 m. high, with slender zigzag glabrous branchlets dark chestnut-brown and lustrous when they first appear, becoming dark gray-brown in their second year, and armed with many stout or slender nearly straight spines 2.5–4 cm. in length.

Oklahoma. La Flore County, rocky slopes and open hillsides near Page, *E. J. Palmer*, No. 2092, April 25, 1921, No. 20629 (type) and 20630, September 24, 1921, Nos. 20921, 20925, April 25, 1922, Nos. 20941, 20986, 20987, April 28, 1922.

This species most resembles *Crataegus padifolia* Sarg. from Swan, Christian County, Missouri, which differs from it in its long ovate leaves and yellow anthers slightly tinged with pink, and in its smaller subglobose fruit.

Crataegus Youngii (§ Microcarpae), n. sp.

Leaves ovate, cuneate and slightly decurrent on the petiole at base, 3-lobed with acute or acuminate lobes, the terminal lobe often divided into small secondary lobes, remotely crenulate-serrate usually only above the middle, glabrous or early in the season villose along the midrib above, dark yellow on the upper surface, paler on the lower surface, 2.–3 cm. long and 2–2.5 cm. wide, with a slender midrib and obscure primary veins extending to the point of the lobes and often also to the base of the sinus; petioles slender, 1–2 cm. in length; leaves on leading vigorous shoots obscurely laterally or obscurely 3-lobed, more abruptly cuneate or rounded

at base, up to 5 or 6 cm. long and 5 or 5.5 cm. wide, their petioles stouter, 2.5–3 cm. long. Flowers 8–10 mm. in diameter, opening from the 8th to the 20th of May on long slender pedicels in mostly 20–25-flowered rather open glabrous corymbs; calyx-tube broad-obconic, glabrous, the lobes small, nearly triangular, apiculate, glabrous, reflexed after anthesis; stamens 15–20; anthers pale yellow; styles 3–5, usually reduced to 1 by abortion of all but one carpel, persistent on the fruit. Fruit ripening in October and persistent on the leafless branches at least until the beginning of the new year, globose to subglobose, scarlet, 5–7 mm. in diameter, the calyx persistent or deciduous, closely appressed to the fruit or raised on a short neck, with enlarged spreading lobes; flesh thin, yellow, dry and mealy; nutlets often reduced to one by abortion, rounded and broader at the apex than at the acute base, rounded and only slightly ridged on the back, distinctly concave on the inner faces, about 4 mm. long and 2 mm. wide, the narrow pale hypostyle extending nearly to the middle.

A tree 8–10 m. high with a tall trunk covered with dark scaly bark, spreading branches forming a wide symmetrical head, and slender nearly straight glabrous branchlets pale green when they first appear, becoming light chestnut-brown before the end of their first season and dark gray-brown the following year and armed with numerous straight slender spines 2–3 cm. in length.

North Carolina. Guilford County, low wet bottoms, near Greensboro, *Robert C. Young*, April and May 8, 1921, *T. G. Harbison*, No. 6110, May 9, 1922, Nos. 6028, 6028a (type), May 23, Oct. 9, 1922. Wake County, near Raleigh, *T. G. Harbison*, No. 6038, Oct. 8, 1922.

South Carolina. Kershaw County, banks of the Wateree River, near Camden, *Susan Delano McKelvey*, Dec. 26, 1922, *T. G. Harbison* (No. 6129), May 23, 1922, Nos. 625 and 628, Oct. 6, 1922.

This is one of the most interesting species of Crataegus which has been discovered recently in the United States. Its relationship is with the Washington Thorn (*C. Phaenopyrum* Medicus) which it resembles in its small flowers and fruit, in the fact that the primary veins of the leaves extend to the sinuses of the leaves as well as to the points of the lobes, in the style persistent on the fruit, and in the general habit of the tree. It differs from that species in its normally acutely 3-lobed leaves, cuneate and decurrent at base on the petiole, not cordate and not rounded except on vigorous shoots. In *Crataegus Phaenopyrum* the calyx is deciduous from the fruit by a circumsissile line and in falling leaves the top of the nutlets exposed, a character which has not been noticed in any other species of the genus. On the fruit of *Crataegus Youngii* the line of separation can often be distinguished but the calyx is usually persistent and if it does fall the end of the nutlets does not become exposed. The nutlets of the new species are narrower and more concave on the inner face, with a less conspicuous hypostyle. From the other Microcarpae it differs in its yellow anthers. The nearly constant abortion of all but one carpel

in the specimens examined is unusual and probably not a constant character.

Crataegus Youngii, so far as now known, is confined to the Piedmont region and the Atlantic coastal plain, while *C. Phaenopyrum*, although it has become sparingly naturalized from cultivation in eastern Pennsylvania and northern Delaware, is a tree of the Mississippi valley, in which it grows from western North Carolina at altitudes of about 700 metres to middle Tennessee, southern Kentucky, and in southern Illinois and southern Missouri, and is now often naturalized in the Ohio valley states.

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE HERBARIUM AND THE COLLECTIONS OF THE ARNOLD ARBORETUM.

Alfred Rehder

Cephalotaxus drupacea var. **nana,** comb. nov.

C. nana Nakai in Tokyo Bot. Mag. xxxiii. 193 (1919).
C. nana var. *adstringens* Nakai, l. c.

Japan. Hokkaido. Ishikari province: Sapporo, *Y. Tokubuchi*, April 1887, July 1888, May 1890; same locality, *C. S. Sargent*, September 17, 1892; Nopporo Forest, *E. H. Wilson*, No. 7274, July 27, 1914 and No. 7408, August 10, 1914, *T. Nakai*, August 1919. Siribeshi province: Takashima, *J. Matsumura* (ex Nakai). Hondo. Aidzu province: Inashiro, T. Nakai (ex Nakai, var. *adstringens*).

Cultivated: Arnold Arboretum, October 14, 1922 (plants raised from seed [No 7588] collected by E. H. Wilson at North Kadoma, foot of Hayachine-san, Rikuchu province, northern Hondo).

As *Cephalotaxus nana* Nakai does not differ from typical *C. drupacea* Siebold & Zuccarini except in its habit, it should be considered only a variety of the latter species. Its relation to the typical form is about the same as that of *Torreya nucifera* var. *radicans* Nakai (Tokyo Bot. Mag. xxxiii. 194 [1919]) to the typical *T. nucifera* Sieb. & Zucc. Nakai's variety *adstringens* does not seem to be a very marked variety; it is said to differ in the adstringent taste and in the brownish color of the fruit from typical *C. nana*. *Cephalotaxus drupacea nana* is a low shrub not exceeding 2.5 m. in height with a creeping root-stock producing at intervals upright shoots which flower and fruit when about 1 m. tall. The young plants growing in the Arboretum appear to preserve the habit of the variety.

Taxus media (*T. baccata* × *cuspidata*), hybr. nov.

Intermediate between the parents; as the type may be taken the plant mentioned below which forms a broadly-pyramidal bush with spreading branches and which probably will grow into a tree. Mature branchlets olive-green or slightly reddish above, somewhat darker the second year, later becoming more or less brown; winter-buds oblong-ovoid, obtuse, with obtuse slightly keeled scales; leaves spreading in two ranks, straight

or slightly falcate, 1–3 cm. long and about 3 mm. broad, abruptly contracted into a mucronate point, with a prominent midrib above and rather lustrous, beneath with broad grayish green bands; petiole reddish, decurrent into the rather abruptly enlarged leaf-cushion. Flowers and fruits not seen.

SPECIMENS EXAMINED: Hort. Walter Hunnewell, Wellesley, Massachusetts, *T. D. Hatfield*, March 18, 1923 (from plant figured by T. D. Hatfield in Garden Mag. XXXIII. 25, as "English Yew"), type; Arnold Arboretum, under No. 11270, October 21, 1922 (plant received from Wellesley).

As the two parent species cannot be separated by strong morphological characters it is even more difficult to point out good characters to distinguish the hybrid; the differences become really apparent only by comparison with living plants of the two parent species. From *T. baccata* L. the hybrid may be distinguished by the darker olive-green, often slightly reddish color of the branchlets, not light or yellowish green as in that species, by the keeled scales of the winter-buds, by the stouter and broader, more abruptly acuminate leaves with a more prominent midrib above and by the abrupt enlargement of the leaf-cushion into the petiole. From *T. cuspidata* it differs chiefly in the olive-green color of the branchlets, not brown the second season as in that species, at least on the more vigorous branchlets, in the obtuse winter-buds with obtuse scales, in the leaves spreading distinctly in two ranks and rather lustrous above. This hybrid was raised by Mr. T. D. Hatfield about 20 years ago together with other forms between different varieties of the parent species which combine the characters of the parents in various degrees. An illustrated article giving a record of his observations was published in 1921 by Mr. Hatfield in vol. XXXIII. of the Garden Magazine (pp. 23–26). One of the forms seems worthy of a distinct name and may be called:

Taxus media f. **Hatfieldii,** forma nova.

Compact shrub of conical outline with upright and ascending branches; winter-buds acutish, with obtuse to acutish slightly keeled scales; leaves radially arranged, straight, 1.5–2.5 cm. long and about 3 mm. broad, rather abruptly pointed, somewhat lustrous above and with a prominent midrib; petiole abruptly enlarged into the leaf-cushion.

SPECIMENS EXAMINED: Hort. Walter Hunnewell, Wellesley, Massachusetts, *T. D. Hatfield*, March 18, 1923 (from plant figured by T. D. Hatfield in Garden Mag. XXXIII. 25 as "Irish Yew").

This form, which is probably a hybrid between *T. cuspidata* and the Irish Yew, *T. baccata* var. *fastigiata* Loud., is particularly valuable for its formal habit and may take, together with the following form, the place of the Irish Yew which is not hardy in the neighborhood of Boston while the forms of *T. media* are perfectly hardy here and probably even farther north.

Taxus media f. **Hicksii,** comb. nov.

T. cuspidata Hicksii Hort.

Shrub with upright and ascending branches forming a columnar bush; winter-buds oblong-conic with obtuse slightly keeled scales; leaves mostly

radially spreading, 1.5–2.3 cm. long and slightly over 2 mm broad, those of the leading shoots more gradually pointed, those of the weaker branchlets abruptly pointed, dark green with a prominent midrib above, grayish green beneath. Aril of fruit with narrow opening; seed ovoid, pointed about 6 mm. long, with usually 2 stronger and 1 or 2 weaker ridges at the apex and with an irregularly shaped obtusely 3 or sometimes 4-angled hilum at base.

SPECIMENS EXAMINED: Arnold Arboretum under No. 8036, September 28, 1922 (plants received from the Hicks Nursery, Westbury, Long Island, in 1921 as *T. cuspidata Hicksii*).

This form which differs from the preceeding in its columnar outline was raised by Mr. H. Hicks from seed of *T. cuspidata* f. *nana* Rehd. collected in Mr. C. A. Dana's garden at Dosoris, Long Island, about 20 years ago. The original plant in the Hicks Nursery at Westbury, Long Island, is now about 1.75 m. tall. Young plants raised from cuttings of the original plant have been growing in the Arnold Arboretum since 1921 and have proved perfectly hardy.

Abies Nordmanniana f. **tortifolia,** forma nova.

A typo recedit foliis falcatis ramulum versus incurvis cincinnatis.

SPECIMENS EXAMINED: Hort. Mrs. William Bayard Cuttery, Oakdale, Long Island, New York, *W. C. Knight*, No. 4, November 5, 1920 and October 14, 1922 (branches with cones).

Instead of having the leaves fairly uniformly pointed forward as in the type the leaves are strongly falcate and curved inward making the arrangement of the leaves appear curly and very irregular. The tree is vigorous and healthy with leaves 2.5–3 cm. long.

Picea Abies f. **argentea,** comb. nov.

Abies excelsa argentea Berg in Schrift. Naturf. Ges. Univ. Dorpat, II. 39 (Ein. Spielart. Fichte) (1887).
Picea excelsa argentea Hort. apud Beissner, Handb. Nadelholzk. 367 (1891).—Schroeter in Ber. Schweiz. Bot. Ges. X. 133 (1900), as lusus.

Of the origin of this form which has the leaves variegated with white I have been unable to find any record.

Picea Abies f. **mucronata,** comb. nov.

Abies communis mucronata Loudon in Gardeners' Mag. n. ser. VII. 386 (1841).
Abies excelsa 12. *mucronata* Hort. apud Loudon, Encycl. Trees & Shrubs, 1027 (1842).—Gordon, Pinetum, 5 (1858).
Abies mucronata Rauch ex Gordon, l. c. (1858) as synon., not Rafinesque.
Pinus Picea var. *mucronata* Endl. apud Lawson, List Pl. Fir Tribe, 18 (1851).
Picea excelsa mucronata Carrière, Traité Conif. 247 (1855).—Sénéclauze, Conif. 28 (1867).—Beissner, Handb. Nadelholzk. 366 (1891).—Hornibrook, Dwarf Conif. 114 (1923).

This form was raised by Briot at the Trianon gardens near Versailles, France, where it was seen by Loudon in 1840 and described one year later. It is a strong growing shrub forming a wide pyramid with ascending or sometimes spreading branches, with stout reddish yellow branchlets

and with rather distant dark green stiff and sharply pointed leaves 0.8–2 cm. long.

Picea Abies. f. columnaris, comb. nov.

Abies excelsa var. *columnaris* Jacques in Ann. Soc. Hort. Paris, XLIV. 653 (1853).
Picea excelsa columnaris Carrière, Traité Conif. 248 (1855).—Boehm in Zeitschr. Forst. Jagdwes. XXV. 228, fig. 4 (1895), as var.—Conwentz in Abh. Landesk. Prov. Westpreuss. IX. 158 (1895), as forma;—Schroeter in Vierteljahrsschr. Naturf. Ges. Zuerich, XLIII. 173, 233, fig. 19–21 (1898), as lusus; in Ber. Schweiz. Bot. Ges. XIII. 109, fig. 4 (1903).—Badoux, Beaux Arbres Cant. Vaud, 40, fig. (1910), as lusus.
P. excelsa var. *pyramidalis* subvar. *columnaris* Schneider in Silva Tarouca, Unsere Freiland-Nadelhoelz. 230, fig. 122 (1913).

This form is a tree with short nearly horizontally spreading much ramified branchlets of nearly equal length giving to the tree a narrow cylindric or columnar shape. It was first described by Jacques, who observed it in cultivation in the nursery of Cochet, at Suimes near Brie Comte Robert (Seine-et-Marne), France; it also has been found growing spontaneously with the type in a few localities in Switzerland and Germany.

Picea Abies f. cupressina, comb. nov.

P. excelsa lusus *cupressina* Thomas in Mitt. Deutsch. Dendr. Ges. XVI. 252, pl. 8 (1909).—Schelle, Winterh. Nadelhoelz. Mitteleur. 82 (1909).
P. excelsa var. *pyramidalis* subvar. *cupressina* Schneider in Silva Tarouca, Unsere Freiland-Nadelhoelz. 230 (1913).

This form is a tree with ascending branches furnished chiefly toward the end with crowded rather short branchlets forming a very compact columnar head rounded at the apex. This rounded apex is the chief difference between this form and *P. Abies* f. *pyramidata* (Carr.) Rehd. which also is a narrow almost fastigiate tree, but of more conical outline and distinctly pointed at the apex. *Picea Abies* f. *cupressina* was discovered by Professor Dr. Thomas in Tambach, Thuringia, Germany, and first described in 1907. The tree has been propagated by grafting and a young plant obtained in 1910 from A. H. Hesse in Weener is growing in this Arboretum.

Picea Abies f. Veitchii, comb. nov.

P. excelsa Gregoriana forma *Veitchii* Hornibrook, Dwarf Conif. 97 (1923).

Mr. Hornibrook states that this was sent out about 25 years ago by Veitch as var. *Gregoriana* together with the true var. *Gregoriana* from which it differs in its more vigorous habit forming a larger, less compact and broader conical bush, in its longer branchlets inclined to droop and in its leaves being radial in arrangement and stiff and needle-shaped only on the leading shoots, thinner and flatter and semi-radial or nearly pectinate on the lateral branchlets.

Picea Abies f. Parsonsii, comb. nov.

P. excelsa Gregoriana forma *Parsonsii* Hornibrook, Dwarf Conif. 98 (1923).

According to Mr. Hornibrook this form was sent out by S. B. Parsons of Flushing, New York, as var. *Clanbrasiliana*. It is similar to *P. Abies*

f. *Gregoryana* Nash (*Abies excelsa* var. *Gregoryana* Gord.), but differs in its more horizontally spreading branches and pendulous branchlets, forming a looser and straggling bush, in its longer branchlets and longer, flatter, rather distant leaves not radially arranged.

Picea Abies f. erythrocarpa, comb. nov.

P. excelsa var. *erythrocarpa* Purkyne in Allg. Forst. & Jagdzeit. LIII. 1, tab. (1877).—Willkomm, Forstl. Fl. ed. 2, 74 (1877).—Voss, Vilmorin's Blumengaert. I. 1241 (1895), as forma.

P. vulgaris var. *erythrocarpa* Jacobasch in Sitzber. Bot. Ver. Prov. Brandenb. XXIV. 98 (1882).—Beck, Fl. Nieder-Oester. 7 (1890).

P. excelsa a. vulgaris f. *erythrocarpa* Wittrock apud Schroeter in Vierteljahrschr. Naturf. Ges. Zuerich, XLIII. 250 (1898).

Pinus Abies f. *erythrocarpa* Voss in Putlitz & Meyer, Landlex. IV. 770 (1913).

According to the color of the young cones two forms can be distinguished, one with green cones f. *chlorocarpa* (Purk.) Th. Fries, and one with violet-purple cones, f. *erythrocarpa*. Both forms are found throughout the range of the species and it seems impossible to determine which of the two should be considered the type of the species, therefore both names must be considered of equal standing.

×**Populus canadensis** Moench, Verz. Bäume & Sträuch. Weissenstein, 81 (1785).—Ascherson, Fl. Prov. Brandenb. I. 646 (1864).—Koehne, Deutsch. Dendr. 81 (1893).—Mathieu, Fl. Forest. 495 (1897).— Ascherson & Graebner, Syn. Mitteleur. Fl. IV. 34 (1908).

? *P. helvetica* Poederle, Man. de l'Arb. II. 148 (1792).

P. latifolia Moench, Méth. 338 (1794).

P. nigra B. *P. helvetica* Poiret, Encycl. Méth. V. 234 (1804).

P. deltoides Schneider, Ill. Handb. Laubholzk. I. 7, fig. 1 d-f, 3 o-p, 9 g-m (1904), non Marshall.

P. pseudocanadensis Schneider, l. c. 8 (1904).

Moench's *Populus canadensis* is apparently the oldest name for the hybrid between *P. nigra* L. and *P. balsamifera* L. (*P. deltoidea Marsh.*).[1] Though the original description is very meagre, the chief character, the absence of the glands at the base of the blade given by Moench to distinguish *P. canadensis* from *P. caroliniensis* (*P. balsamifera* L.) is precisely the character by which the leaves of this hybrid differ from those of *P. balsamifera*. A number of varieties more or less differing in minor characters have arisen in cultivation.

× **P. canadensis** var. **serotina**, comb. nov.

P. serotina Hartig, Naturgesch. Forstl. Culturpfl. 437 (1851).—Henry in Elwes & Henry, Trees Great Brit. Irel. VII. 1816, t. 409, fig. 16 (1913).

P. angulata a. *serotina* Dippel, Handb. Laubholzk. II. 202 (1892).—Koehne, Deutsch. Dendr. 82 (1893).

This variety which seems to have originated in France about the middle of the eighteenth century is probably the type of *P. canadensis*. It is

[1] Henry (in Elwes & Henry, Trees Great Brit. Irel. VII. 1807, footnote) says that the identity of *P. canadensis* Moench is doubtful and that it is possibly the same as *P. angulata* Aiton, but the fact that Moench particularly emphasizes its hardiness as compared with his *P. heterophylla* which he describes as tender, does not sustain Henry's suggestion. I am, however, inclined to believe that Moench's *P. heterophylla* which certainly is not *P. heterophylla* L. is identical with *P. angulata* Ait.

known only in its staminate form. To this variety belong the two following forms:—

× **P. canadensis** var. **serotina** f. **erecta**, comb. nov.

P. monilifera erecta Selys-Longchamps in Bull. Soc. Bot. Belg. II. 11, 13 (1864).
P. canadensis b. erecta Dippel, Handb. Laubholzk. II. 200 (1892), excl. syn. of Carrière.
P. deltoides f. *erecta* Schneider, Ill. Handb. Laubholzk. I. 7 (1904), excl. syn. of Carrière.
P. serotina var. *erecta* Henry in Elwes & Henry, Trees Great Brit. Irel. VII. 1817 t. 385 (1913).

A form with ascending branches forming a rather narrow pyramida tree.

× **P. canadensis** var. **serotina** f. **aurea**, comb. nov.

P. canadensis aurea van Geerti André in Ill. Hort. XXIII. 26, t. 232 (1876).
P. canadensis d. *aurea* van Geert apud Dippel, Handb. Laubholzk. II. 200 (1892).
P. serotina var. *aurea* Henry in Elwes & Henry, Trees Great Brit. Irel. VII. 1817 (1913).

A form with yellow leaves.

× **P. canadensis** var. **regenerata**, comb. nov.

"Peuplier regeneré" Carrière in Rev. Hort. 1865, 58, 276.
P. canadensis f. *grandifolia* h. bot. apud Dieck, Nachtr. Haupt-Verz. Zoeschen, 1887, 16, nomen nudum.
P. canadensis regenerata Hort. ex Schelle in Beissner, Schelle & Zabel, Handb. Laubholz-Ben. 16 (1903) as synon.
P. regenerata Hort. ex Schneider, Ill. Handb. Laubholzk. I. 7 (1904), as synon. of *P. deltoidea*.—Henry in Elwes & Henry, Trees Great Brit. Irel. VII. 1824 (1913).

This variety originated according to Carrière near Paris in 1814. It is very similar to the preceding variety, but unfolds its leaves about a fortnight earlier and is known only in the pistillate form.

× **P. canadensis** var. **marilandica**, comb. nov.

P. marilandica Bose apud Poiret, Encycl. Méth. Suppl. IV. 378 (1816).—Henry in Elwes & Henry, Trees Great Brit. Irel. VII. 1828, t. 409, f. 19 (1913).
P. canadensis Hartig, Naturgesch. Forstl. Culturpfl. 436 (1851).
P. euxylon Dode in Mém. Soc. Hist. Nat. Autun, XVIII. 41. 69 (Extr. Mon. Populus) (1905).

This variety the history of which is unknown has probably the same origin as var. *serotina*. It is a less vigorous trees of more spreading habit and resembles more *P. nigra* than its American parent, while var. *serotina* and var. *regenerata* are nearer the latter.

× **P. canadensis** var. **Eugenei** hort. Simon-Louis frères apud Schelle in Beissner, Schelle & Zabel, Handb. Laubholz-Ben. 16 (1903).

"Peuplier Eugène" Carrière in Rev. Hort. 1865, 58.
P. Eugenei Simon-Louis ex K. Koch, Dendr. II. 1, 493 (1872), pro forma *P. canadensis*.—Mathieu in Gartenfl. XXXXVI. 675 (1887), sine descript.—Schneider, Ill. Handb. I. 9, (1904).—Sargent in Trees & Shrubs, II. 212 (1913).—Henry in Elwes & Henry, Trees Great Brit. & Irel. VII. 1826, f. 409 f. 17 (1913).

P. pyramidalis meetensis Mathieu in Gartenfl. XXXVI. 674 (1887), pro synon. *P. Eugenei*.

? *P. Charkoviensis* Schroeder in Moeller's Deutsch. Gaert.-Zeit. XVIII. 393, fig. (1902).

P. Canadensis × *nigra* B. *Eugenei* Ascherson & Graebner, Syn. Mitteleur. Fl. IV. 45 (1908).

This is supposed to be a hybrid between *P. canadensis* and *P. nigra* var. *italica* and originated in the nursery of Simon-Louis at Plantières near Metz in 1832. It approaches the Lombardy Poplar in its smaller leave smore cuneate at the base and in the narrow pyramidal habit. It is the Carolina Poplar of American gardens.

To this group of hybrids (*P. balsamifera* × *nigra*) apparently belong also *P. Lloydii* Henry and *P. Henryana*, *P. Krauseana*, and *P. ramulosa* Dode. More information about the different forms mentioned above will be found in Elwes & Henry, Trees Great Brit. & Irel. VII. 1814–1831.

× **Ribes Knightii** (*R. divaricatum* × *Lobbii*), nom. nov.

Ribes divaricatum × *Lobbi* J. K. Henry in Canad. Field-Nat. XXXIII. 94 (1920).

Upright shrub; young branchlets puberulous, glabrous and yellowish gray the second year; spines stout, simple or 3-parted, 0.8–1.5 cm. long, light brown, lustrous. Leaves suborbicular in outline, deeply 3-lobed or sometimes 5-lobed, 2–3.5 cm. across, with obtuse crenate-dentate or lobulate lobes, dull green above and slightly pilose or nearly glabrous at maturity, sparingly villose beneath, more densely so on the veins, glandular when young; petioles 1–2.5 cm. long, thinly villose and slightly stipitate-glandular, setose toward the base. Flowers with the leaves, 8–10 mm. long, 1–3 on a peduncle 4–8 mm. long; pedicels 2–4 mm. long, glabrous or nearly so like the peduncle; calyx-tube campanulate, about 3 mm. long, greenish outside and loosely villose like the sepals, the latter oblong, dark red, more than twice as long as the calyx-tube, reflexed; ovary densely stipitate-glandular; petals broadly cuneate-spatulate, 3 mm. long, white or pinkish at the truncate apex, stamens about as long as sepals with oval, green anthers. Fruit sparingly developed, subglobose, about 1 cm. across, claret-red, glandular-setose, crowned by the persistent calyx.

SPECIMENS EXAMINED: Hort. George Fraser, Ucluelet, Vancouver, British Columbia, *G. Fraser*, 1920 (flowers), July 27, 1922 (fruit).

This handsome hybrid was found by Mr. George H. Knight of Mount Tolmie Nursery, Victoria, British Columbia, growing among the parents, *R. divaricatum* Dougl. and *R. Lobbii* Gray, at Mill Hill, Vancouver Island. It was removed to his nursery and propagated and cuttings sent to Mr. G. Fraser from whom we received our specimens. It was first described by Professor J. K. Henry (l. c.) and its intermediate character clearly set forth by him, though he expresses some slight doubt in regard to the hybrid character of the plant, saying that in the genus spontaneous hybrids between wild species are unknown in North America and that hybrids are produced with difficulties by the horticulturist. His first statement is apparently true and seems to apply not only to American but also Old

World species, but in regard to the second statement I may point to the fact that Janczewski in his monograph of the genus and in the supplements to it describes more than 25 different hybrids, many of them having originated spontaneously in gardens.

Cotoneaster Franchetii Bois var. **cinerascens**, var. nov.

A typo recedit praecipue habitu robustiore foliis majoribus ad 4 cm. longis plerisque elliptico-ovatis et acuminatis saepius diametro majore infra medium, subtus laxius villoso-tomentosis colore vix albido sed cinereo vel virescente, corymbis in apice ramulorum elongatorum ad 5 cm. longis multifloris.

SPECIMENS EXAMINED: Weed Landscape Nursery, Beaverton, Oregon, *H. E. Weed*, June 1922 and September 20, 1921 (received as Cotoneaster sp. Schneider No. 309 from the Arnold Arboretum).

This variety looks at first glance very distinct from typical *C. Franchetii* and bears some resemblance in its more vigorous upright habit and in the larger usually acuminate leaves less densely tomentose and less white on their under surface to *C. foveolata* Rehd. & Wils., but in flower and fruit it agrees exactly with typical *C. Franchetii* except that the inflorescence is generally larger and borne on longer branchlets. It was raised at the Arnold Arboretum from seed received in 1915 from Mr. C. Schneider under No. 309 collected in Yunnan or southwestern Szechuan; the plants did not prove very hardy in this Arboretum and did not reach sufficient size to flower but plants sent to Oregon are growing well as the flowering and fruiting specimens which we have received show. Among Schneider's herbarium material of *C. Franchetii* of which we have Nos. 1761 and 3415 from Yunnan and 3491 from southern Szechuan there is no specimen which agrees with the new variety.

Pyracantha crenulata var **kansuensis**, var. nov.

A typo recedit praecipue foliis minoribus supra medium tantum sparsim crenato-serrulatis, corymbis sub fructu leviter adpresse villosulis, fructibus minoribus depresso-subglobosis.—Folia anguste oblonga vel oblanceolata, apice rotundata, obtusa vel interdum acutiuscula, 1–2.5 cm. longa et 4–8 mm. lata, minora elliptica vel anguste elliptica, 6–10 mm. longa; petioli 0.5–2 mm. longi, glabri; corymbi vix 2 cm. diam., fructus 3–5 gerentes (sed in specimenibus spontaneis ut videtur majores et pluriflori); fructus circiter 5 mm. diam., scarlatini.

CHINA. Kansu, near Yan-pu-ko, *F. N. Meyer*, No. 1784 (S. P. I. No. 40736) October 6, 1914.

CULTIVATED: plants raised from seed distributed by the Dept. of Agriculture under No. 40736: Arnold Arboretum, *A. Rehder*, October 2, 1917 (sterile); Chico, Seed and Plant Introduction Station, *Peter Bisset*, September 14, 1919 (sterile); Santa Barbara, *E. O. Orpet*, November 29, 1922 (type).

This variety seems nearest to *P. crenulata* var. *Rogersiana* A. B. Jacks., but differs from it and from the type chiefly in the pubescent corymb, a character by which it approaches *P. coccinea* Roem., but that species has larger acute more sharply serrulate leaves of different shape, slenderer

pubescent petioles and often a slight pubescence on the midrib beneath, and larger fruit. Meyer's original specimens are unfortunately in such a bad state of preservation that it did not seem wise to take them as the type of this form particularly as the pubescence of the corymb is no longer recognizable on that fragmentary material.

Malus yunnanensis var. **Veitchii**, var. nov.

Pyrus Veitchii Hort. in Gard. Chron. ser. 3, LII. 288 (1912), nomen.—Veitch, Cat. New Hardy Pl. China, Autumn 1913, 12.

Pyrus yunnanensis Bean in Bot. Mag. CXLI. t. 8629 (1915), in part, and as to plant figured.

Malus yunnanensis Rehder in Sargent, Pl. Wilson. II. 287 (1915), in part, as to the Hupeh plant.

A typo recedit foliis fere omnibus distinctius lobulatis lobulis breviter acuminatis vel acuminulatis basi magis cordatis autumno subtus glabrescentibus fructibus intense rubris albo-maculatis laevibus.

CHINA. Hupeh: Fang Hsien, woods alt. 1600–2300 m., *E. H. Wilson*, No. 2994, May 19, 1907; without precise locality, *E. H. Wilson*, Veitch Exp. No. 670. Eastern Szechuan: Wushan Hsien, *A. Henry*, No. 5638.

CULTIVATED: Arnold Arboretum, May 26, 1914, October 3, 1918, May 26, 1922; Kew Arboretum, May, 1914, September 28, 1922.

This variety differs from the type in the generally larger ovate leaves all or nearly all distinctly lobulate with short-acuminate lobules becoming glabrescent in autumn and in the more brightly colored smooth fruit, while in the typical form the leaves are ovate to oblong-ovate, less often cordate at base, partly or mostly without any trace of lobules or less deeply lobulate, more densely tomentose beneath with more persistent tomentum; the inflorescence is usually smaller, more compact and more densely tomentose and the fruit is verruculose and of duller color. As in some other species of wider distribution in central China the plants from Hupeh and eastern Szechuan, east of the Red Basin, though conspecific differ more or less from those from western Szechuan, west of the Red Basin. In the herbarium these differences are often not so pronounced and may escape notice, but when both forms are in cultivation and can be seen growing side by side the differences are becoming more apparent. The variety was introduced by E. H. Wilson for Veitch in 1901 and in 1907 a plant was received from the Veitchian nurseries at this Arboretum. The type originally described from Yunnan was found in 1908 by E. H. Wilson in western Szechuan and seeds sent by him to this Arboretum were received in February, 1909. Both forms have proved hardy at the Arnold Arboretum and have grown into handsome pyramidal trees; as an ornamental plant the variety is to be preferred on account of its more brightly colored fruit.

× **Acer zoeschense** f. **elongatum**, comb. nov.

Acer neglectum elongatum Schwerin in Mitt. Deutsch Dendr. Ges. XX. 423 (1911).

As *Acer neglectum* Lange is preoccupied by *A. neglectum* Hoffmannsegg the name *A. zoeschense* Pax will be the next oldest name for the hybrid

between *A. campestre* and *A. Lobelii*. The form *elongatum* differs from the type chiefly in its deeply 3-lobed leaves with elongated lobes undulate at the margin and often lobulate, the middle lobe ovate to ovate-oblong usually narrowed at the base and the lateral lobes often with a larger lobe on their lower side, and in the red color of their veins beneath and the petiole.

(*To be continued*)

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ENUMERATION OF THE LIGNEOUS PLANTS OF NORTHERN CHINA.

ALFRED REHDER

GINKGOACEAE TO RANUNCULACEAE

DURING the last ten or fifteen years several important collections of plants from northern China have been received at the Arnold Arboretum, the most extensive being those made by W. Purdom, F. N. Meyer, J. Hers and R. N. Cowdry. In the course of the determination of these collections which have greatly extended our knowledge of that flora it has appeared desirable to make a complete survey of the known ligneous plants of the region.

Northern China as here understood includes the six northern provinces Chili, Shantung, Honan, Shansi, Shensi and Kansu; it borders north on Manchuria and Mongolia and south on the Chinese provinces Kiangsu, Anwhei, Hupeh and Szechuan and extends from the Yellow Sea to the high table land of Tibet. The whole area is situated between 100° and 123° E. Long. and 32° and 42° N. Lat. and is traversed by a mountain range running from east to west with a bend to south or southwest in Shansi, reaching in the Tsing ling shan an altitude of about 3350 m. and connecting in Kansu with the high mountains of the Tibetan border; it is drained chiefly by the system of the Hwang ho or Yellow River. An account of the phytogeography of the region, the relation of its flora to that of the neighboring regions, the history of its botanical exploration and other important facts on the botany of the region will be given at the conclusion of the systematic enumeration which is based chiefly on the collections at the Arnold Arboretum and includes references to the literature previously published on the ligneous plants of the region. Under each species and variety there are given, besides the original place of publication of the names, only such citations as contain references to the occurrence of the plant under consideration in northern China. No attempt is made to cite all the synonyms, but in most cases a reference is given to a place where a complete enumeration of synonyms can be found.

GINKGOACEAE

Ginkgo biloba Linnaeus, Mant. Alt. 313 (1771).—Debeaux in Act. Soc. Linn. Bordeaux, XXXIII. 66 (Fl. Tien-tsin, 43) (1879).—Faber in Denkschr.

Entwickel. Kiautschou, 27 (1898).—Masters in Jour. Linn. Soc. XXVI. 546 (1902).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 15 (1904).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XIII. 25, no. 19390 (1908).—Rehder & Wilson in Sargent, Pl. Wilson. II. 1 (1914).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 83 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII. 111 (1922); Liste Ess. Lign. Honan, 14 (1922).

Salisburia adiantifolia Smith in Trans. Linn. Soc. III. 330 (1797).—Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. III. 136 (Enum. Pl. Chin. Bor. 62) (1833).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).

CHILI: Temple court yard near Peking, *F. N. Meyer*, no. 226, October, 1905 (Herb. U. S. Dept. Agric.).—See also Bunge, l. c., Maximowicz, l. c., Debeaux, l. c., and Masters, l. c.).

SHANTUNG: near Tsingtau (ex Gilg, l. c.).—See also Faber, l. c., Meyer, l. c. and Loesener, l. c.

HONAN: cultivated (ex Hers, l. c.).

This tree is much planted in northern and eastern China, particularly in temple grounds. The only locality where it is supposed to grow spontaneously is near Chang hua hsien in Chekiang, as stated by F. N. Meyer in a letter to C. S. Sargent (see Arnold Arb. Bull. Pop. Inform. n. ser. II. 52 [1916]).

TAXACEAE

Cephalotaxus drupacea Sieb. & Zucc. var. sinensis Rehder & Wilson in Sargent, Pl. Wilson. ii. 3 (1914).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XLII. 52, nos. 40017, 40018 (1918).—Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 7 (1922).

Cephalotaxus Fortunei Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 102 (Pl. David. I. 292) (1884).—Beissner in Nuov. Giorn. Bot. Ital. n. ser. IV. 186 (1897); in Bull. Soc. Bot. Ital. 1901, 358.—Pritzel in Bot. Jahrb. XXIX. 213 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. II. 5 (1914), quoad specimen e Shensi.—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 303 (1922).—Non Hooker.

Cephalotaxus pedunculata Franchet, in Nouv. Arch. Mus. Paris, sér. 2, VII. 102 (Pl. David. I. 292) (1884).—Pritzel in Bot. Jahrb. XXIX. 214 (1900).—Beissner in Bull. Soc. Bot. Ital. 1901, 358.—Non Siebold & Zuccarini.

Cephalotaxus Griffithii Beissner in Bull. Soc. Bot. Ital. 1901, 358; non Hooker f.

HONAN: Sung hsien, San kuan miao, *J. Hers*, no. 550, May 24, 1919.—See also Hers, l. c.

SHENSI: "Huo kiao zaez" *G. Giraldi*, July 16, 1897; Tai pei shan, *W. Purdom*, 1910; Kwan yin tang, alt. 1300 m., *F. N. Meyer*, no. 1669, September 15, 1914; Nan to chu, south of Sian fu, *F. N. Meyer*, no. 1687, January 31, 1914 (Herb. U. S. Dept. Agric.); Lung chow, Li kia po, alt. 1400 m., *J. Hers*, no. 2378, July 4, 1922.—See also Franchet, l. c., Beissner, l. c., Pritzel, l. c., Rehder & Wilson, l. c., Limpricht, l. c. and Meyer, l. c.

DISTRIBUTION: also Hupeh, Szechuan.

The specimens from Shensi referred by Beissner, Pritzel and others to *C. Fortunei* Hook. seem to represent only a form of *C. drupacea* var.

sinensis with somewhat longer leaves. The true *C. Fortunei* Hook. is a more southern species and apparently does not extend farther north than the Yangtze valley region.

Taxus chinensis Rehder in Jour. Arnold Arb. I. 51 (1919).

Taxus baccata Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 103 (Pl. David. I. 293) (1884).—Pritzel in Bot. Jahrb. XXIX. 214 (1900).—Non Linnaeus.

Taxus cuspidata var. *chinensis* Rehder & Wilson in Sargent, Pl. Wilson. II. 8 (1914).

SHENSI: Tai pei shan, *W. Purdom*, 1910.—See also Franchet, l. c., Pritzel, l. c., Rehder & Wilson, l. c.

KANSU: Fu orr yei, *F. N. Meyer*, no. 1790, October 8, 1914 (Herb. U. S. Dept. Agric.).

DISTRIBUTION: also Chekiang, Hupeh, Szechuan.

PINACEAE

Pinus Armandi Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 95, t. 12 (Pl. David. I. 284) (1885).—Beissner in Nuov. Giorn. Ital. n. ser., IV. 184 (1897).—Masters in Jour. Linn. Soc. XXVI. 549 (1902).—Shaw in Sargent, Pl. Wilson. II. 12 (1914); Gen. Pinus, 30, t. 9, fig. 96–99 (1914).—Wilson, Conif. Tax. Jap. 20 (1916).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XXXIX. 134, no. 38468 (1917).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 21 (1922).

Pinus koraiensis Beissner in Nuov. Giorn. Bot. Ital. n. ser. IV. 184 (1897).—Patschke in Bot. Jahrb. XLVIII. 657 (1912).—Non Siebold & Zuccarini.

Pinus quinquefolia David, Jour. Trois. Voy. Chin. I. 192 (1875).—Bretschneider, Hist. Eur. Bot. Disc. China, 850 (1898).

SHENSI: Ta hua shan, alt. 5000 ft., *F. N. Meyer*, no. 1833 (or 2047a), December 29, 1913 (cones); without locality, *G. Giraldi*.—See also David, l. c., Franchet, l. c., Beissner, l. c., Masters, l. c., Shaw, l. c. and Meyer, l. c.

HONAN: see Hers, l. c.

KANSU: Chi shan, near Cheng hsien, *F. N. Meyer*, no. 1760, October 1, 1914 (sterile branch).

DISTRIBUTION: also Hupeh, Szechuan, Yunnan, Kweichou; Korea, southern Japan, Formosa.

Pinus Bungeana Zuccarini apud Endlicher, Syn. Conif. 166 (1847).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Fortune, Yedo & Peking, 377, 378, fig. (1863).—Hance in Jour. Linn. Soc. XIII. 87 (1873).—Beissner in Nuov. Giorn. Bot. Ital. n. ser. IV. 185 (1897).—Pritzel in Bot. Jahrb. XXIX. 215 (1900).—Masters in Jour. Linn. Soc. XXVI. 549 (1902).—Shaw in Sargent, Pl. Wilson. II. 13 (1914); Gen. Pinus, 40, t. 14, fig. 133–137 (1914).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 21 (1922).

CHILI: Peking, temple grounds near Summer Palace, *C. S. Sargent*, September 17, 1903; near Peking, *S. W. Williams*, August, 1876 (Herb.

Gray); same locality, *J. G. Jack*, October 7, 1905, and *F. N. Meyer*, no. 327, December, 1905; Peking University Medical College grounds, planted, *N. H. Cowdry*, no. 2151, September, 1921.—See also Endlicher, l. c., Fortune, l. c. and Masters, l. c.

HONAN: see Hers, l. c.

SHANSI: Hsi po po, alt. 4000 ft., *F. N. Meyer*, no. 1399, October 7, 1914.

SHENSI: *G. Giraldi* (ex Beissner, l. c., and Pritzel, l. c.).

KANSU: Yin kwan chien, near Liang sang, alt. 3600 ft., *F. N. Meyer*, no. 1737, September 23, 1914.

DISTRIBUTION: also Hupeh.

This Pine is restricted to northern China and is not found south of the 31° N. Lat.; its western limit of distribution is southeastern Kansu where it is reported to be "quite plentiful" by F. N. Meyer. This tree was discovered by Bunge on whose specimen Endlicher based his species. Bunge himself mentions it (in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 137 [Enum. Pl. Chin. Bor. 63] [1833]) as one of the two specimens which on account of the absence of cones could not be properly determined.

Pinus sinensis Lambert, Descr. Pinus, ed. minor, I. 47 t. 29 (1832).—Mayr, Fremdl. Wald- u. Parkb. 349, fig. 113 (1906), exclud. synon.—Shaw in Sargent, Pl. Wilson. II. 15 (1914); Gen. Pinus, 60, t. 23, figs. 201–207 (1914).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 21 (1922).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 304 (1922).

Pinus Massoniana Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 137 (Enum. Pl. Chin. Bor. 63) (1833).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Debeaux in Act. Soc. Linn. Bordeaux, XXXI. 364 (Fl. Tché-foû, 131) (1877).—Faber in Denkschr. Entwickel. Kiautschou, 27 (1898).—Pritzel in Bot. Jahrb. XXIX. 215 (1900).—Non Lambert.

Pinus leucosperma Maximowicz in Bull. Acad. Sci. St. Pétersb. XVI. 558 (1881); in Mél. Biol. XI. 347 (1881).

Pinus Thunbergi Debeaux in Act. Soc. Linn. Bordeaux, XXXIII. 66 (Fl. Tientsin, 43) (1879).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 255 (1884); in Nouv. Arch. Mus. Paris, sér. 2, VII. 95 (Pl. David. I. 285) (1884).—Beissner in Nuov. Giorn. Bot. Ital. II. ser., IV. 185 (1897).—Faber in Denkschr. Entwickel. Kiautschou, 27 (1898).—Pritzel in Bot. Jahrb. XXIX. 215 (1900).—Masters in Jour. Linn. Soc. XXVI. 552 (1902).—Non Parlatore.

Pinus densiflora Franchet in Mém. Soc. Sci. Nat. Cherbourg XXIV. 255 (1882).—Pritzel in Bot. Jahrb. XXIX. 215 (1900).—Masters in Jour. Linn. Soc. XXVI. 549 (1902).—?Gilg & Loesener in Bot. Jahrb. XXXIV. Beibl. LXXV. 16 (1904).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Import. XVII. 16, no. 22913 (1909).—?Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 83 (1919).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaiho) (1922).—Non Siebold & Zuccarini.

Pinus spec. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XV. 23, no. 22673 (1909).

CHILI: Peking plain, *C. S. Sargent*, September 17, 1903; vicinity of Peking, *Butler*, 1906; Ming tombs, *J. G. Jack*, October, 1905; grounds

of Temple of Heaven, *E. H. Wilson*, no. 2513, May 16, 1910; Tung-ling, *F. N. Meyer*, no. 1172a, November 29, 1908; Weichang, *W. Purdom*, no. 812, 1910; Hsiao Wutai shan, alt. 5000 ft., *F. N. Meyer*, no. 1250, August 22, 1913; without precise locality, *A. Bunge* (Herb. Gray).—See also Bunge, l. c., Maximowicz, l. c., Debeaux, l. c. (1879), Franchet, l. c. (Pl. David.), Masters, l. c., Meyer, l. c. (no. 22913), Shaw, l. c., Cowdry, l. c., and Limpricht, l. c.

SHANTUNG: Tsingtau, *O. Nebel* (ex Gilg & Loesener, l. c.); Lau shan, *A. Engler* (ex Loesener, l. c.).—See also Debeaux, l. c. (1877), Franchet, l. c. (Mém. Cherbourg), Faber, l. c.

HONAN: see Hers, l. c.

SHANSI: Wutai shan, *W. Purdom*, nos. 813, 815, 1911; same locality, *F. N. Meyer*, no. 258, February 27, 1908; Hsi po po, *F. N. Meyer*, no. 1398, October 7, 1914; Tong djan tchang, *F. N. Meyer*, no. 278, March 2, 1908; Wu chai tsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2045, September 7, 1922.—See also Meyer, l. c. (no. 22673).

SHENSI: Ta hua shan, alt. 4000 ft., *F. N. Meyer*, no. 1828, December 29, 1913.—See also Beissner, l. c., Pritzel, l. c.

KANSU: along Tetung River, *N. Przewalski*, August 6, 1880; Tow River Valley, *W. Purdom*, no. 814, 1910.—See also Maximowicz, l. c. (1881).

DISTRIBUTION: also Hupeh, Kiangsi, Szechuan, Yunnan (var. *yunnanensis* Shaw); Manchuria.

The references for Shantung from where I have seen no spontaneous material are doubtful and are, at least partly, based on cultivated trees of *P. densiflora* Sieb. & Zucc. which is planted near Tsingtau and Chifu (C. S. Sargent, September 22, 1903).

Larix Potaninii Batalin in Act. Hort. Petrop. xiii. 385 (1893).—Rehder & Wilson in Sargent, Pl. Wilson. II. 18 (1914).

Larix spec. Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 97 (Pl. David. I. 287) (1884).

Larix chinensis Beissner in Mitteil. Deutsch. Dendr. Ges. v. 68 (1896); in Nuov. Giorn. Bot. Ital. n. ser. IV. 183 t. 5, fig. 1 (1897).—Pritzel in Bot. Jahrb. XXIX. 216 (1900).—Masters in Jour. Linn. Soc. XXVI. 558 (1902).

SHENSI: Tsin-ling range, Tai pei shan, alt. 3000–3300 m., *W. Purdom*, no. 404, 1910. See also Franchet, l. c., Beissner, l. c., Pritzel, l. c. and Masters, l. c.

KANSU: Lotani, road to Siku ting, alt. 3000–3300 m., *W. Purdom*, no. 760, 1911; Peling shan, *W. Purdom*, no. 817, 1911.

DISTRIBUTION: also western Szechuan.

Larix dahurica var. **Principis Rupprechtii** Rehder & Wilson in Sargent, Pl. Wilson. II. 21 (1914).

Larix Principis Rupprechtii Mayr, Fremdl. Wald- u. Parkb. 309, fig. 94 (1906).

Larix spec. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XV. 23, no. 22674 (1909).

Larix dahurica Meyer l. c. XXXVII. 58, no. 36728 (1916).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 304 (1922).—Non Turczaninow.

CHILI: Weichang south, *W. Purdom*, no. 21, 1909; Weichang, north and west, *W. Purdom*, nos. 204, 246, 1909; Hsiao wu tai shan, alt. 9000 ft., *F. N. Meyer*, no. 1121, August 6, 1913; same locality, *J. Hers*, no. 1545, July 14, 1921, no. 1564, July 16, 1921, no. 2116, October 7, 1922. Po hua shan, *J. Hers*, no. 1427, July 1, 1922.—See also Rehder & Wilson, l. c., Meyer, l. c. (1916), and Limpricht, l. c.

SHANSI: Wutai shan, "Thai ling tse" temple, *F. N. Meyer*, no. 259, February 25, 1908; Wutai shan, over the pass, alt. 2600–3000 m., *W. Purdom*, 1909; Wutai village, temple grounds, *W. Purdom*, nos. 161, 161a, 161b, 1909; Wu chai tsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2018, September 7, 1922.—See also Mayr, l. c., Meyer, l. c. (1909), and Rehder & Wilson, l. c.

DISTRIBUTION: also northern Korea.

Picea Wilsonii Masters in Gard. Chron. ser. 3, XXXIII. 133, figs. 55, 56 (1903).—Rehder & Wilson in Sargent, Pl. Wilson, II. 27, 1914.

Picea Mastersii Mayr, Fremdl. Wald- u. Parkb. 328, fig. 105–107 (1905).

Abies spec. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XV. 23, no. 22671 (1909).

Picea Schrenkiana Rehder & Wilson in Sargent, Pl. Wilson, II. 29 (1914), pro parte; non Fischer & Meyer.

CHILI: Weichang, west, south, and northeast, alt. 1300 m., *W. Purdom*, nos. 100, 201, 202, 203, 1909; south of Jehol, *W. Purdom*, no. 205, 1909; Hsiao wutai shan, *F. N. Meyer*, no. 1122, August 6, 1913 (in part); *J. Hers*, no. 1509, July 14, 1921; Hsiao wu tai shan, Tieh ling, *J. Hers*, no. 2114, October 7, 1922; Hsiao wu tai shan, Shuih shih tao, alt. 1500 m., *J. Hers*, nos. 2149, 2155, October 8, 1922; Huai lai tsien, Liu shu chwang, alt. 800 m., *J. Hers*, no. 2071, October 3, 1922.—See also Rehder & Wilson, l. c.

SHANSI: Wutai shan, "Pei san tse" temple, alt. 2000–2300 m., *F.N. Meyer*, no. 256 (22671), April 20, 1908; same locality, *W. Purdom*, no. 145, 1909; Wu chai tsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2041a, September 7, 1922.—See also Mayr, l. c., and Meyer, l. c.

KANSU: Lotani, *W. Purdom*, no. 806, 1911; near Kagoba, *F. N. Meyer*, no. 2001, November 1, 1914 (Herb. U. S. Dept. Agric.).—See also Rehder & Wilson, l. c.

DISTRIBUTION: also Hupeh.

Picea Meyeri Rehder & Wilson in Sargent Pl. Wilson, II. 28 (1914).

Abies spec. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XV. 23, no. 22672, 24, no. 22679 (1909).

Picea Schrenkiana Rehder & Wilson, l. c. 29 (1914), pro parte.—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 304 (1922).—Non Fischer & Meyer.

Picea obovata Meyer in U. S. Dept. Agric. Bur. Indust. Invent. Seeds Pl. Imp. XXXVII. 58 no. 36729 (1916); non Ledebour.

CHILI: Hsiao wu tai shan, *F. N. Meyer*, nos. 1122 (in part), 1387, August 6 and 29, 1913; Hsiao wu tai shan, Tieh ling, *J. Hers*, no. 2115, October 7, 1922; Po hua shan, *J. Hers*, no. 1685, September 9, 1921;

near Peking, grave yard, *J. Hers*, no. 1557, January, 1921.—See also Meyer, l. c. (1915), and Limpricht, l. c.

Shansi: Wutai shan, Temple of "Tchai ling tse," *F. N. Meyer*, no. 257 (22672, type), February 25, 1908; Wutai shan, alt. 3000 m., *W. Purdom*, no. 144, 1910; Ta lau tse, *F. N. Meyer*, no. 275 (S. P. I. no. 22679), March 1, 1908 (Herb. U. S. Dept. Agric.); Wuchai tsien, Ta nan kow, *Tchuang Kieh*, Hers nos. 2032, 2041, September 7, 1922.—See also Meyer, l. c. (1909), Rehder & Wilson, l. c. 28.

Kansu: Tao chau ting, *W. Purdom*, no. 790, 1911; Choni, *W. Purdom*, no. 813, 1911; near Liang dja pa, alt. 2000 m., *F. N. Meyer*, October 14, 1914; Ku len tze, *F. N. Meyer*, November 25, 1914; Tow River, *W. Purdom*, no. 790, 1911.—See also Rehder & Wilson, l. c. 28, 29.

This and the preceding species seem to be the only Spruces which occur in northeastern China; *P. Meyeri* has not yet been found outside of this area, while *P. Wilsonii* extends into northern Hupeh. Additional material received after the publication of the account of these species in Plantae Wilsonianae has shown that both species are very variable, but that it is not possible to distinguish a third species and that the specimens enumerated under *P. Schrenkiana* should be referred partly to *P. Meyeri* and partly to *P. Wilsonii*. These two species are quite distinct; in *P. Wilsonii* the branchlets are slenderer, always glabrous, with very short scarcely raised petioles, and very pale, becoming light gray or whitish the second year, when the bark begins to peel off in small thin flakes; the leaves are rather short and slender and usually straight, the cones are pale yellowish or grayish brown, dull and 4–8 cm. long; in *P. Meyeri* the branchlets are stouter, more or less pubescent, with distinct spreading petioles 1–2 mm. long, and with cinnamon-brown to dull orange-yellow firm and close bark changing later to gray; the leaves are stout, usually curved and obtusish, the cones are brown and lustrous and 6–10 cm. long with firm and stiff scales. The leaves of most of the specimens enumerated here under *P. Wilsonii* have stouter and more obtuse leaves than the type and it is possible that *P. Mastersii* Mayr which was based on Shansi material represents a northern form of *P. Wilsonii* with more obtuse and stouter leaves.

To one of these two species probably belongs the Picea spec. found by Nebel at Tsingtau near Huitshuen (see Bot. Jahrb. xxxiv. beibl. lxxv. 16 [1904] and Beih. Bot. Centralbl. xxxvii. abt. ii. 84 [1919]). Nebel also states that dry branches of this Spruce are brought from the Laushan for fuel. As Professor Loesener writes me no specimens of this Shantung Spruce have been sent to the Berlin Botanical Museum.

Picea purpurea Masters in Jour. Linn. Soc. xxxvii. 418 (1906).—Rehder & Wilson in Pl. Wilson, ii. 29 (1914).

Kansu: Tao chau ting, *W. Purdom*, no. 815, 1911.—See also Rehder & Wilson, l. c.

Distribution: also western Szechuan.

Tsuga chinensis Pritzel in Bot. Jahrb. XXIX. 217 (1900).—Rehder & Wilson in Sargent Pl. Wilson, II, 37 (1914).

SHENSI: southern slopes of the Tai pei shan, alt. 2300 m., *W. Purdom*, no. 668, 1910.—See also Rehder & Wilson, l. c.

DISTRIBUTION: also western Hupeh, Szechuan.

Abies chensiensis Van Tieghem in Bull. Soc. Bot. France, XXXVIII. 413 (1891).—Pritzel in Bot. Jahrb. XXIX. 218 (1900).—Rehder & Wilson in Sargent, Pl. Wilson, ii, 44 (1914).

Abies spec. Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII, 100 (Pl. David. I. 290) (1884).

Abies firma Masters in Jour. Linn. Soc. XXVI. 557 (1900), quoad specimen e Shensi; non Siebold & Zuccarini.

SHENSI: Tsin-ling mountains, *A. David* (type) 1872.—See also Franchet, l. c., Rehder & Wilson, l. c.

DISTRIBUTION: also western Hupeh.

Abies Fargesii Franchet in Jour. de Bot. XIII. 256 (1899).—Rehder & Wilson in Sargent, Pl. Wilson. II. 48 (1914).

? *Abies Veitchii* Beissner in Nuov. Giorn. Bot. Ital. n. ser. IV. 184 (1897). – Pritzel in Bot. Jahrb. XXIX. 218 (1900).—Masters in Jour. Linn. Soc. XXVI. 557 (1902).—Non Lindley.

SHENSI: Tai pei shan, alt. 3000 m., *W. Purdom*, no. 405, 1910.—See also Masters, l. c., Pritzel, l. c., and Rehder & Wilson, l. c. (sub *A. sutchuenensis*).

KANSU: near Kagoba, *F. N. Meyer*, no. 1813, October 30, 1914 (sterile).

DISTRIBUTION: also western Hupeh, eastern Szechuan.

Young plants growing in this Arboretum of Purdom's no. 405 which were in Plantae Wilsonianae doubtfully referred to *A. sutchuenensis*, apparently belong to *A. Fargesii*.

Abies sutchuenensis Rehder & Wilson in Sargent, Pl. Wilson. II. 48 (1914).

KANSU: Lotani, *W. Purdom*, no. 805, 1911; banks of Tow River, *W. Purdom*, no. 823, 1911.—See also Rehder & Wilson, l. c.

DISTRIBUTION: also eastern Szechuan.

Abies nephrolepis Maximowicz in Bull. Acad. Sci. St. Pétersb. sér. 3, X. 486 (1866); in Mél. Biol. VI. 22 (1866).

Abies sibirica Ledeb. var. *nephrolepis* Trautvetter in Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 260 (Prim. Fl. Amur.) (1859).—Rehder & Wilson in Sargent, Pl. Wilson. II. 49 (1914).

CHILI: Hsiao wu tai shan, *J. Hers*, nos. 1537, 1546, July 14, 1921 and no. 1563, July 16, 1921.

SHANSI: Wutai shan, *W. Purdom*, no. 143, 1909.—See also Rehder & Wilson, l. c.

DISTRIBUTION: also Manchuria to Amur region and Korea.

Cunninghamia lanceolata Hooker in Bot. Mag. liv. t. 2743 (1827).—Rehder & Wilson in Sargent, Pl. Wilson. ii. 50, (1914).

Cunninghamia sinensis Brown apud Richard Conif. 80, t. 18, fig. 3 (1826).—Debeaux in Act. Soc. Linn. Bordeaux, xxxi. 364 (Fl. Tché-foû, 131) (1877).—Beissner in Nuov. Giorn. Bot. Ital. n. ser. iv. 185 (1897).—Pritzel in Bot. Jahrb. xxix. 218 (1900).

Shantung: near Chifu (ex Debeaux, l. c.).

Shensi: *G. Giraldi* (ex Beissner, l. c. and Pritzel, l. c.).

Distribution: also Kiangsu, Chekiang, Kiangsi, Hupeh, Szechuan, Yunnan, Kwangtung, Fokien.

Near Chifu the tree is apparently only planted.

Cryptomeria japonica D. Don in Trans. Linn. Soc. xviii. 166, t. 13, fig. 1 (1841).—Gilg in Bot. Jahrb. xxxiv. beibl. lxxv. 16 (1904).—Rehder & Wilson in Sargent, Pl. Wilson. ii. 52 (1914).—Loesener in Beih. Bot. Centralbl xxxvii. abt. ii. 84 (1919).

Planted near Tsingtau, Shantung, by the German Forest Department according to Gilg (l. c.) and Loesener (l. c.).

Cupressus torulosa D. Don, Prodr. Fl. Nepal. 55 (1825).—Rehder & Wilson in Sargent, Pl. Wilson. ii. 54 (1914).

Kansu: open semi-arid valley near Chu kun, *F. N. Meyer*, no. 1981, October 18, 1914.

Distribution: also western Szechuan, Yunnan; Himalayas.

Two unnamed species of which I have seen no material are mentioned by Hers (in Jour. N. China Branch R. As. Soc. liii. 109 [1922]; Liste Ess. Lign. Honan, 10 [1922]) as cultivated in Honan. Also *C. funebris* Endl., collected by Limpricht (Bot. Reis. Hochgeb. Chin. Ost-Tib. 305 [1922]) at a temple west of Peking, is probably only planted.

Thuja orientalis Linnaeus, Spec. 1002 (1753).—Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. ii. 137 (Enum. Pl. Chin. Bor. 63) (1833).—Turczaninow in Bull. Soc. Nat. Moscou, x. no. vii. 157 (1837).—Faber in Denkschr. Entwickel. Kiautschou, 27 (1898).—Pritzel in Bot. Jahrb. xxix. 219 (1900).—Masters in Jour. Linn. Soc. xxvi. 540 (1902).—Gilg in Bot. Jahrb. xxxiv. beibl. lxxv. 16 (1904).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. xii. 60, no. 17926 (1907).—Rehder & Wilson in Sargent, Pl. Wilson. ii. 53 (1914).—Loesener in Beih. Bot. Centralbl. xxxvii. abt. ii. 84 (1919).—Bailey, Gent. Herb. i. 10 (1920).—Hers in Jour. N. China Branch R. As. Soc. liii. 116 (1922); Liste Ess. Lign. Honan, 31 (1922).

Biota orientalis Endlicher, Syn. Conif. 47 (1847).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. ix. 477 (Ind. Fl. Pekin.) (1857). -Debeaux in Act. Soc. Linn. Bordeaux, xxxi. 364 (Fl. Tché-foû, 131) (1877); l.c. xxxiii. 65 (Fl. Tien-tsin, 42) (1879).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, xxiv. 255 (1884).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. ii. 847 (Pl. Enum. 63) (1891); in Szechenyi, Wissensch. Ergeb. Reise Ostas. ii. 737 (1898).—Beissner in Nuov. Giorn. Bot. Ital. n. ser. iv. 185 (1897).

CHILI: Peking, Temple of Confucius, *C. S. Sargent*, September 15, 1903; Peking, Temple of Heaven, *F. N. Meyer*, no. 393, January, 1907; north of Peking, Ming tombs, *J. G. Jack*, October 6, 1905. See also Bunge, l. c., Turczaninow, l. c., Maximowicz, l. c., Debeaux, l. c. (1879), and Meyer, l. c.

SHANTUNG: near Chifu (ex Debeaux, l. c. [1877] and Franchet, l. c.). near Kiautschou (ex Gilg, l. c.).—See also Faber, l. c. and Loesener, l. c.

HONAN: Kio shan, *L. H. Bailey* (ex Bailey, l. c.).—See also Hers, l. c.

SHENSI: stony mountain slopes near Nan to tchou, south of Sianfu, alt. 2000 ft., *F. N. Meyer*, no. 1846, January 21, 1914; Yenan Fu, *W. Purdom*, no. 355, 1910.—See also Beissner, l. c., Pritzel, l. c., and Rehder & Wilson, l. c.

KANSU: "in valle Wej-ho," *L. Loczy* (ex Kanitz, l. c.).

DISTRIBUTION: also Hupeh, Szechuan; Manchuria, Korea, in other parts of China as in Formosa and Japan probably planted.

Juniperus formosana Hayata in Jour. Coll. Sci. Tokyo XXV. art. XIX. 209, t. 38 (Fl. Mont. Formos.) (1908).—Rehder & Wilson in Sargent, Pl. Wilson II. 56 (1914).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XLIII. 65, no. 40678 (1918).

Juniperus rigida Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 102 (Pl. David. I. 292) (1884).—Beissner in Nuov. Giorn. Bot. Ital. n. ser. IV. 186 (1897).—Pritzel in Bot. Jahrb. XXIX. 219 (1900). Non Siebold & Zuccarini.

Juniperus taxifolia Beissner in Giorn. Soc. Bot. Ital. 1901, 360; non Hooker & Arnott.

CHILI: without locality, *Père Chanet*, no. 7, 1918.

SHENSI: Tai pei shan, *W. Purdom*, 1910.—See also Beissner, l. c. and Rehder & Wilson, l. c.

KANSU: Kwatsa on Siku River (ex Meyer, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Kiangsu, Fokien; Formosa.

I have seen no specimens of this species from Kansu and I am not sure if Meyer's determination of the Juniper collected at Kwatsa is correct. According to Hers (in Jour. N. China Branch R. As. Soc. LIII. III [1922]; Liste Ess. Lign. Honan, 16 [1922]) this species is cultivated in Honan; possibly also the specimen collected in Chili by Père Chanet is from a cultivated plant.

Juniperus squamata var. **Fargesii** Rehder & Wilson in Sargent, Pl. Wilson. II. 59 (1914).

Juniperus saltuaria Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XLIII. 65, no. 40677 (1918); non Rehder & Wilson.

SHANSI: Yo yang hsien, Shen fo ling, alt. 800 m., *J. Hers*, no. 2468, December 16, 1922 (sterile).

KANSU: Siku, *F. N. Meyer*, no. 1827, November 14, 1914.—See also Meyer, l. c.

DISTRIBUTION: also Szechuan.

Juniperus squamata Lamb. f. **Wilsonii** Rehder in Jour. Arnold Arb. I. 191 (1920).

J. squamata Rehder & Wilson in Sargent, Pl. Wilson II. 57 (1914), pro parte, non Lambert.

Juniperus recurva Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 102 (Pl. David I. 292) (1884).—Beissner in Nuov. Giorn. Bot. Ital. n. ser. IV. 186 (1907).—Pritzel in Bot. Jahrb. XXIX. 219 (1900).—Non Hamilton.

SHENSI: Tai pei shan, *W. Purdom*, 1910; without locality, *W. Purdom*, no. 656 (seeds only; plants growing in this Arboretum).—See also Rehder & Wilson, l. c., and Rehder, l. c.

DISTRIBUTION: also Hupeh, Szechuan.

Juniperus squamata var. **Meyeri** Rehder in Jour. Arnold Arb. III. 207 (1922).

? *Juniperus spec.* Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XV. 56, no. 23022 (1909).

CHILI: Tientsin, cultivated, *F. N. Meyer* (ex Rehder, l. c.).—See also Meyer, l. c.

This Juniper is known only as a cultivated plant. In a letter dated February 17, 1923, Mr. J. Hers sends the following additional information about it:

"*Juniperus squamata* var. *Meyeri* is extremely common in the Chinese gardens, where it is known under the name of tsuei pai, which means the kingfisher's thuya; it is generally kept in pots and lends itself very well to those extravagant forms, so much appreciated by the Chinese.

I have never seen it on its own roots; it is always grafted on *Thuya orientalis*. It is a very slow grower; very old specimens may be seen in almost every garden, but they never exceed 5 or 6 feet in height. It is not considered to be hardy in Peking, though it is in Honan. I have never seen it bearing seeds.

As to its origin, I supposed that the one quoted by Meyer, 'south-western Shantung' is nothing else but the Tsaochow district, which used to be the biggest horticultural center of North China, but has now lost some of its importance.

Most of the Peking gardeners agree that the best 'tsuei pai' come not from Tsaochow, but from Lungchüan, which is another horticultural center, a few miles west of Changtefu, in Northern Honan, at the foot of the Shansi hills."

Juniperus chinensis Linnaeus, Mant. 127 (1767).—Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 137 (Enum. Pl. Chin. Bor. 63) (1833).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Debeaux in Act. Soc. Linn. Bordeaux, XXXIII, 66 (Fl. Tien-tsin, 43) (1879).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 256 (1884); in Nouv. Arch. Mus. Paris, sér. 2, VII. 101 (Pl. David. I. 291) (1884).—Beissner in Nuov. Giorn. Bot. Ital. n. ser. IV. 186 (1897).—Faber in Denkschr. Entwickel. Kiautschou, 27 (1898).—Pritzel in Bot. Jahrb. XXIX. 220 (1900).—Masters in Jour. Linn. Soc. XXVI. 541 (1902).—Rehder & Wilson in Sargent, Pl. Wilson. II. 60 (1914).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XL. 65, no. 40679, 66, no. 40680 (1918).—Bailey, Gent. Herb. I. 10 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 111 (1922); Liste Ess. Lign. Honan, 16 (1922).

CHILI: Peking, Temple of Confucius, *C. S. Sargent*, September, 1903, *J. G. Jack*, October 3, 1905; Peking, Temple of Heaven, *J. G. Jack*, October 3, 1905; without precise locality, *Père Chanet*, nos. 49, 50, 1918.—See also Bunge, l. c., Maximowicz, l. c., Franchet, l. c. (Pl. David.), and Masters, l. c.

SHANTUNG: see Franchet, l. c. (Mém. Cherbourg), and Faber, l. c.

HONAN: see Bailey, l. c. and Hers, l. c.

SHENSI: base of the Tai pei shan, *W. Purdom*, 1910; near Sianfu, *F. N. Meyer*, no. 1712, July 25, 1914; without locality, *G. Giraldi*, 1897.—See also Beissner, l. c., Masters, l. c., Rehder & Wilson, l. c. and Meyer, l. c.

KANSU: Cultivated; see Meyer, l. c.

DISTRIBUTION: also Kiangsu, Hupeh, Szechuan, Hunan, Fokien; Korea, Japan.

According to Hers (l. c.) this species and *J. chinensis* var. variegata Fort. are planted in Honan; also Bailey (l. c.) found the species only planted, but states that the trees in Kio shan are said to have been transferred from the wild.

Juniperus chinensis var. pendula Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 101 (Pl. David. I. 291) (1884).

SHENSI: Tsin ling shan, *A. David*, January, 1873 (fragments and photograph of type specimen).

Juniperus saltuaria Rehder & Wilson in Sargent, Pl. Wilson. II. 61. (1914).

KANSU: Peling shan, alt. 3300–3600 m., *W. Purdom*, 1911.

DISTRIBUTION: also northwestern Szechuan.

GNETACEAE

Ephedra equisetina Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. VII. 499 (1851).—Stapf in Denkschr. Math.-Nat. Cl. Akad. Wiss. Wien, LVI. pt. 2, 81, t. 3, fig. XXI. 1–4 (Art. Ephedra) (1889).—Skan in Jour. Linn. Soc. XXVI. 538 (1899).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaiho) (1922).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 305 (1922).

Ephedra vulgaris Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859); non Richard.

Ephedra procera Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 94 (Pl. David. I. 284) (1884); non C. A. Meyer.

Ephedra sp. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XV. 57, no. 23026 (1909).—Hers in Jour. N. China Branch R. As. Soc. LIII. 110 (1922); Liste Ess. Lign. Honan, 12 (1922).

CHILI: Peitaho, rocks at sea-shore, *N. H. Cowdry*, no. 489, 1918.—See also Maximowicz, l. c., Franchet, l. c., Stapf, l. c., Skan, l. c., Cowdry, l. c. and Limpricht, l. c.

HONAN: cultivated (ex Hers, l. c.).

SHANSI: Tai yuen fu, cultivated, *F. N. Meyer*, no. 688, March 31, 1908 (ex Meyer, l. c.).

KANSU: Ta tsing chan, *A. David* (ex Franchet, l. c., Stapf, l. c. and Skan, l. c.).

DISTRIBUTION: also Central Asia.

I have not seen Meyer's specimen, but there is a plant under his number growing in this Arboretum; Meyer states that the cultivated plants he

saw had come from Honan, where the Ephedra is also cultivated according to Hers (l. c.).

Ephedra intermedia C. A. Meyer var. **glauca** Stapf in Denkschr. Math.-Nat. Cl. Akad. Wiss. Wien, LVI. pt. 2, 62, t. 2, fig. XV. 3, 5, 8 (Art. Ephedra) (1889).—Skan in Jour. Linn. Soc. XXVI. 539 (1902).

KANSU: *N. Przewalski* (ex Stapf, l. c. and Skan, l. c.).

DISTRIBUTION: also Central Asia to Persia and Kashmir.

Ephedra monosperma C. A. Meyer, Versuch Monog. Ephedra, 89, t. 8, fig. 11 (1847).—Stapf in Denkschr. Math.-Nat. Cl. Akad. Wiss. Wien, LVI. pt. 2, 73, t. 3, fig. XIX. 1–9, XXXI. 3 (Art. Ephedra) (1889).—Skan in Jour. Linn. Soc. XXVI. 539 (1902).

KANSU: *N. Przewalski* (ex Stapf, l. c. and Skan, l. c.).

DISTRIBUTION: also Central Asia to the Amur.

GRAMINEAE

Sasa spec.

Arundinaria spec. Loesener in Beih. Bot. Centralbl. XXXVII. 92 "Vielleicht *A. japonica* Sieb. & Zucc." (1919).

SHANTUNG: Lau shan, *O. Nebel* (ex Loesener, l. c.).

This Bamboo is said to be common in the valleys and to grow up to 8 m. tall near the monastery Lanting, but to remain low and scrubby at higher altitudes.

Arundinaria nitida Mitford in Gard. Chron. ser. 3, XVIII. 186, t. 33 (1895).—Rendle in Jour. Linn. Soc. XXXVI. 436 (1904).—Camus, Bambusées, 33, t. 9, fig. A, t. 12, fig. A (1913).—Purpus in Moeller's Deutsch. Gaertn.-Zeit. XXX. 93, fig. (1915).

SHENSI: Tai pei shan, *W. Purdom*, no. 980, 1910.

KANSU: No collection, but cultivated as *Arundinaria spec.* Kansu (ex Purpus, l. c.).

DISTRIBUTION: also Szechuan, Hupeh.

Though this species has been distributed by the firm of Regel and Kesselring, St. Petersburg, under the designation *Arundinaria spec.* Kansu, as stated by Purpus (l. c.) and as I found it myself in several gardens, there seems to be no record of any specimens collected in Kansu. It is, however, possible that it really grows in southern Kansu, as it was originally discovered by Potanin in northern Szechuan and has also been collected by Purdom in southern Shensi.

Phyllostachys reticulata K. Koch, Dendr. II. 2, 356 (1873).—Makino in Tokyo Bot. Mag. XXVI, 19, fig. 6 (1912).

Phyllostachys bambusoides Siebold & Zuccarini in Abh. Akad. Muench. III. 746, t. 5, fig. 3 (1843).— Loesener in Beih. Bot. Centralbl. XXVII. abt. II. 92 (1919).

SHANTUNG: Cape Yatau, near Tai tsching kung (ex Loesener, l. c.).

DISTRIBUTION: also Japan.

To this species probably belongs at least one of the three Phyllostachys sp. from Honan mentioned by Hers (Liste Ess. Lign. Honan, 20, 21 [1922]).

LILIACEAE

Smilax herbacea L. var. **acuminata** Wright in Jour. Linn. Soc. XXXVI. 97 (1903).—Norton in Sargent, Pl. Wilson. III. 1 (1916).

SHENSI: Tai pei shan, *W. Purdom*, no. 1097, 1910.

DISTRIBUTION: also Kiangsi, Hupeh, Szechuan; Manchuria.

Smilax herbacea L. var. **flaccida** Norton apud Bailey, Gent. Herb. I. 15 (1920).

HONAN: Chi kung shan, *L. H. Bailey* (ex Bailey, l. c.).

DISTRIBUTION: also Hupeh.

Smilax herbacea L. var. **angusta** Wright in Jour. Linn. Soc. XXXVI. 98 (1903).

SHANTUNG: Chifu, among rocks on hills, *N. H. Cowdry*.

DISTRIBUTION: also Hupeh.

The plant from Lau shan, and Cape Yatau (ex Gilg & Loesener in Bot. Jahrb. XXXIV. beibl. LXXV. 26 [1904] and ex Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 103 [1919]) seems to represent a different variety according to a fragment of Krug's no. 577 before me which is entirely destitute of tendrils and has rather small elliptic slender-petioled leaves.

Smilax Oldhamii Miq. var. **ussuriensis** A. De Candolle, Monog. Phaner. I. 54 (1878).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 257 (1882).—C. H. Wright in Jour. Linn. Soc. XXXVI. 100 (1903).

SHANTUNG: Chifu, *A. A. Faurel* (ex Franchet, l. c. and Wright, l. c.).

DISTRIBUTION: also Korea, Manchuria.

Smilax microphylla C. H. Wright in Kew Bull. Misc. Inform. 1895, 117.—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 23 (1905).—Norton in Sargent, Pl. Wilson. III. 2 (1916).

SHENSI: *G. Giraldi*, no. 6999 (ex Diels, l. c.).

DISTRIBUTION: also Hupeh, Szechuan.

Smilax Sieboldii Miquel in Versl. Kon. Med. Kon. Akad. Wetensch. ser. 2, II. 87 (1868).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 103 (1919).

Smilax Nebelii Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 26 (1904). Norton in Sargent, Pl. Wilson. III. 12 (1916).

SHANTUNG: Lau shan, Cape Yatau (ex Gilg, l. c. and Loesener, l. c.).

DISTRIBUTION: also Korea, Japan.

Smilax scobinicaulis C. H. Wright in Kew Bull. Misc. Inform. 1895, 117.—Norton in Sargent, Pl. Wilson. III. 2 (1916).—Hers in Jour. N.

China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 29 (1922).

Smilax brevipes Warburg in Bot. Jahrb. XXIX. 258 (1900).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 23 (1905).

CHILI: without locality, *Père Chanet*, no. 19, 1918.

HONAN: Yung ning, Tsi li ping, *J. Hers*, no. 458, May 22, 1919.—See also Hers l. c.

SHANSI: Yuan kin hsien, Ni shan, *J. Hers*, no. 1821, September 28, 1921.

SHENSI: *G. Giraldi* (ex Diels, l. c.).

DISTRIBUTION: also Hupeh.

Smilax pekingensis A. De Candolle, Monog. Phaner. I. 108 (1878).—C. H. Wright in Jour. Linn. Soc. XXXVI. 100 (1903).—Norton in Sargent, Pl. Wilson. III. 2 (1916).

CHILI: Peking, *H. Wawra* (ex A. De Candolle, l. c. and Wright, l. c.).

SHENSI: Tai pei shan, *W. Purdom*, no. 1299, 1910.

DISTRIBUTION: also Szechuan.

Smilax vaginata Decaisne in Jacquemont, Voyage, IV. Bot. 169, t. 169 (1844).—Norton in Sargent, Pl. Wilson. III. 2 (1916).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XL. 33, no. 38827 (1917).—Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 29 (1922).

?Smilax stans Maximowicz in Bull. Acad. Sci. St. Pétersb. XVII. 170 (1872); in Mél. Biol. VIII. 407 (1872).—Warburg in Bot. Jahrb. XXXVI. beibl. LXXXII. 23 (1905).

CHILI: without locality, *Père Chanet*, 1918.

HONAN: without locality, *J. Hers*.—See also Hers, l. c.

SHENSI: Ta hua shan, shady places, alt. 1300 m., *F. N. Meyer*, no. 1390, December 29, 1913; Tai pei shan, *W. Purdom*, no. 1100, 1910.—See also Meyer, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan, northwest Himalayas.

Smilax trachypoda Norton in Sargent Pl. Wilson. III. 3 (1916).

?Smilax stans Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 23 (1905); non Maximowicz.

SHENSI: Tai pei shan, western valley, *W. Purdom*, no. 431, 1910.—See also Diels, l. c.

KANSU: Chi-shan, near Cheng hsien, *F. N. Meyer*, no. 1751, October 1, 1914 (Herb. U. S. Dept. Agric.).

DISTRIBUTION: also Hupeh.

As I have not seen any of Giraldi's specimens cited by Diels, it remains doubtful if *S. stans* of Diels belongs to this or to the preceding species.

Smilax china Linnaeus, Spec. 1029 (1753).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 258 (1884).—C. H. Wright in Jour. Linn. Soc. XXXVI. 96 (1903).—Gilg & Loesener in Bot. Jahrb. XXXIV. beibl. LXXV. 25 (1904).—Norton in Sargent, Pl. Wilson. III. 4 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 103 (1919).—Bailey, Gent. Herb. I. 15 (1920).

SHANTUNG: *A. C. Maingay;* Chifu, *E. Faber* (ex Wright, l. c.), *A. A. Faurel* (ex Franchet, l. c.); Lau shan, *O. Nebel* (ex Gilg & Loesener, l. c., and ex Loesener, l. c.).

HONAN: Chi kung shan, *L. H. Bailey* (ex Bailey, l. c.).

DISTRIBUTION: also Kiangsu, Chekiang, Kiangsi, Hupeh, Szechuan, Fokien, Kwangtung, Hongkong, Kwangsi; Korea, Formosa.

Smilax menispermoidea A. de Candolle, Monog. Phaner. I. 108 (1878).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 23 (1905).

SHENSI: *G. Giraldi* (ex Diels, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Yunnan; Sikkim.

Smilax glauco-china Warburg in Bot. Jahrb. XXIX. 255 (1900).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 22 (1905).—Norton in Sargent, Pl. Wilson. III. 5 (1916).—Bailey, Gent. Herb. I. 15 (1920).

HONAN: Chi kung shan, *L. H. Bailey* (ex Bailey, l. c.).

SHENSI: "Huo kia zaez," *G. Giraldi*, no. 6967 (ex Diels, l. c.).

DISTRIBUTION: also Kiangsi, Hupeh.

Smilax discotis Warburg in Bot. Jahrb. XXIX. 256 (1900).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 22 (1905).—Norton in Sargent, Pl. Wilson. III. 6 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 28 (1922).

Smilax longipes Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); non Warburg.

HONAN: Sung hsien, San kuan miao, alt. 1400 m., *J. Hers*, no. 529, May 24, 1919; Lu shih, Hiung eul shan, alt. 1300 m., *J. Hers*, no. 874, October 9, 1919; Lu shih, Lao kiun shan, *J. Hers*, nos. 1170, 1186, September 21, 1919.—See also Hers, l. c.

SHENSI: Tai pei shan, *W. Purdom*, no. 1098, 1910.—See also Diels, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan.

Smilax discotis var. concolor Norton in Sargent, Pl. Wilson. III. 6 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 28 (1922).

HONAN: Yung ning, Tsi li ping, alt. 1000 m., *J. Hers*, no. 1355, September 30, 1919; Sung hsien, Shih tze miao, alt. 1200 m., *J. Hers*, no. 1257, September 25, 1919; Lu shih, Hiung eul shan, alt. 1300 m., *J. Hers*, nos. 869, 875, October 9, 1919.—See also Hers, l. c.

DISTRIBUTION: also Hupeh.

Heterosmilax Gaudichaudii Maxim. ex Hers. in Jour. N. China Branch R. As. Soc. LIII. 111 (1922); Liste Ess. Lign. Honan, 14 (1922), is probably a mistake; there is no *Heterosmilax Gaudichaudiana* Maxim. in the collection sent by Mr. Hers to this Arboretum and it is very doubtful if the range of that species extends as far north as Honan.

SALICACEAE

Populus euphratica Olivier, Voy. Empire Othoman. III. fig. 45–46 (1807).—Burkill in Jour. Linn. Soc. XXVI. 536 (1899).—Schneider in Sargent, Pl. Wilson. III. 30 (1916).

CHILI: Peking, *R. Alcock* (ex Burkill, l. c.).

KANSU: beyond the Great Wall, *P. J. Piasezki* ex Maximowicz (ex Burkill, l. c.).

DISTRIBUTION: also Central and Western Asia, North Africa.

It is extremely doubtful if the specimens recorded from Chili and from Kansu belong to this species, and I suppose that specimens of *P. tomentosa* Carr. with small deeply dentate and glabrous leaves have been taken for *P. euphratica*.

Populus suaveolens Fischer in Allgem. Garten-Zeit. IX. 404 (1841).—Maximowicz in Bull. Soc. Nat. Moscou, LIV. 51 (1879).—Schneider in Sargent, Pl. Wilson. III. 18 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 22 (1922).

Populus balsaminifera (*sic*) Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 842 (Pl. Enum. 57) (1891); in Szechenyi, Wissensch. Ergeb. Reise Ostas. II. 732 (1898); non *P. balsamifera* L.

Populus balsamifera var. *suaveolens* Loudon, Arb. Brit. III. 1674 (1838).—Burkill in Jour. Linn. Soc. XXVI. 535 (1899), pro parte.—Seemen in Bot. Jahrb. XXIX. 275 (1900).

CHILI: Huai lai hsien, Liu shu chwang, alt. 800 m., *J. Hers*, nos. 2079, 2080, October 3, 1922; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, no. 2091, October 4, 1922; Ta hung men, *J. Hers*, no. 2217, October 10, 1922; Hsiao wu tai shan, alt. 1800 m., *F. N. Meyer*, no. 1311, August 23 and 28, 1913; same locality, *J. Hers*, no. 1488, July 14, 1921; Pohua shan, *J. Hers*, no. 1654, September 9, 1921; Nankow, *J. Hers*, no. 1597, August 14, 1921; Peking plain, *C. S. Sargent*, September 17, 1903; Jehol, *W. Purdom*, no. 2, 1909.—See also Maximowicz, l. c., Burkill, l. c. and Schneider, l. c.

SHANSI: Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers nos. 2021, 2022, September 7, 1922; Lin hsien, Nan yan shan, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2067, September 11, 1922.

SHENSI: Yenan fu district, *W. Purdom*, no. 351, 1910.—See also Burkill, l. c. and Seemen, l. c.

KANSU: between the river Hoangho and the Great Wall, *P. J. Piasezki* (ex Maximowicz, l. c., Burkill, l. c. and Schneider, l. c.), *L. Loczy* (ex Kanitz, l. c.).

DISTRIBUTION: also Szechuan; Manchuria, Sungaria to Turkestan.

Plants raised from cuttings received from Purdom under nos. 283, 283a, 672, 672a are growing in this Arboretum.

Populus suaveolens var. **Przewalskii** Schneider in Sargent, Pl. Wilson. III. 32 (1916).

Populus Przewalskii Maximowicz in Mél. Biol. XI. 321 (1881); in Bull. Acad. Sci. St. Pétersb. XXVII. 540 (1882).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 842 (Pl. Enum. 57) (1891); in Szechenyi, Wissensch. Ergebn. Reise Ostas. II. 732 (1898).—Burkill in Jour. Linn. Soc. XXVI. 537 (1899).

KANSU: between the river Hoangho and the Great Wall, *N. Przewalski* (ex Maximowicz, l. c., and Schneider, l. c.); *L. Loczy* (ex Kanitz, l. c.).

DISTRIBUTION: also Mongolia, eastern Tibet.

Populus Purdomii Rehder in Jour. Arnold Arb. III. 225 (1922).

Populus suaveolens Przewalski Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Import. XLII. 35, pl. 5 (1918); non Schneider.

SHENSI: Tai pei shan, *W. Purdom*, no. 1111 (type), 1910, no. 1110, 1910.—See also Rehder, l. c.

KANSU: near Kagoba, alt. 2300–2600 m., *F. N. Meyer*, nos. 1816, 1993, October 30, 1914; Yin kwan dien, *F. N. Meyer*, no. 1945, September 23, 1914.—See also Meyer, l. c. and Rehder, l. c.

DISTRIBUTION: also Szechuan.

Populus Simonii Carrière in Rev. Hort. 1867, 360.—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 841 (Pl. Enum. 58) (1891); in Szechenyi, Wissensch. Ergeb. Reise Ostas. II. 732 (1898).—Schneider in Sargent, Pl. Wilson. III. 21 (1916).—Bailey, Gent. Herb. I. 16 (1920).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaho) (1922).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 22 (1922).

Populus balsamifera var. *Simonii* Wesmael in Bull. Soc. Bot. Belg. XXVI. 378 (1887).—Burkill in Jour. Linn. Soc. XXVI. 536 (1899).

Populus balsamifera var. *laurifolia* Burkill, l. c. 535 (1899), ? in part; non Wesmael.

CHILI: near San tun ying on sandy places along mountain streams, *F. N. Meyer*, nos. 974, 975, May 31, 1913; Kalgan, Methodist compound, *N. H. Cowdry*, no. 1441, June 6, 1921; Nankow, *J. G. Jack*, October 6, 1905; Si wan tze, *G. E. Simon* (ex Burkill, l. c.); Ta han ling, *J. Hers*, no. 1642, September 7, 1921; Po hua shan, *J. Hers*, no. 1561, September 9, 1921; Huai lai hsien, Liu shu chwang, alt. 800 m., *J. Hers*, no. 2073, Oct. 3, 1922; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, no. 2090, October 4, 1922; Peking, western hills, alt. 600–700 m., *J. Hers*, nos. 2219, 2227, October 11, 1922; Peking, *J. Hers*, nos. 2255, 2256, 2257, 2259, October 18, 1922.—See also Burkill, l. c., Schneider, l. c. and Cowdry, l. c.

HONAN: Nei hwang, alt. 100 m., *J. Hers*, no. 2557, October 31, 1922.—See also Bailey, l. c. and Hers, l. c.

SHENSI: Lung chow, Kuan shan, alt. 2000 m., *J. Hers*, no. 2333, July 3, 1922.

KANSU: *L. Loczy*, no. 184 (ex Kanitz, l. c.).

DISTRIBUTION: also Hupeh, Szechuan; Manchuria, Korea.

Populus Simonii f. fastigiata Schneider in Sargent, Pl. Wilson. III. 22 (1916).

CHILI: Shi ling, planted, *F. N. Meyer*, photograph no. 5288, April 13, 1907 and no. 5412, January 25, 1908; plants raised from cuttings introduced from that locality are growing in this Arboretum.

SHANTUNG: Tsinan fu, planted, *F. N. Meyer*, photograph no. 5335, September 26, 1907, no. 5831, April 8, 1913.

Populus nigra L. var. **italica** Du Roi, Harbk. Baumz. II. 141 (1772).—Schneider in Sargent, Pl. Wilson. III. 36 (1916).

Populus nigra var. *sinensis* Carrière in Rev. Hort. 1867, 340.—Maximowicz in Bull. Soc. Nat. Moscou, LIV. 50 (1879).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 255 (1884).—Burkill in Jour. Linn. Soc. XXVI. 536 (1899).—Seemen in Bot. Jahrb. XXIX. 275 (1900).

? *Populus acuta* David, Jour. Trois. Voy. Chin. I. 294 (1875).—Bretschneider, Hist. Eur. Bot. Disc. China, 851 (1898).

CHILI: Peking, Temple of Heaven grounds, *N. H. Cowdry*, no. 2153, November 21, 1921; without locality, *G. E. Simon* (ex Carrière, l. c.).

SHANTUNG: near Chifu, cultivated ?, *A. A. Fauvel* (ex Franchet, l. c.).

SHENSI: near Pai shi pu, planted, *F. N. Meyer*, no. 1942, September 18, 1914; without locality, *P. J. Piasezki* (ex Maximowicz, l. c., Burkill, l. c., Seemen, l. c. and Schneider, l. c.).—See also David, l. c.

KANSU: *P. J. Piasezki* (ex Maximowicz, l. c., Burkill, l. c. and Schneider, l. c.).

DISTRIBUTION: also cultivated in Europe and western Asia.

This Poplar has been planted wherever it occurs in China.

Populus tomentosa Carrière in Rev. Hort. 1867, 340.—Schneider in Sargent, Pl. Wilson. III. 37 (1916).—Bailey, Gent. Herb. I. 16 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 22 (1922).

? *Populus coriacea* David, Trois. Voy. Chin. I. 294 (1875), nomen.

Populus alba var. *denudata* Maximowicz in Bull. Soc. Nat. Moscou, LIV. 48 (1879); non Hartig.

Populus alba Franchet in Mém. Sci. Nat. Cherbourg, XXIV. 255 (1884).—Burkill in Jour. Linn. Soc. XXVI. 535 (1899).—Seemen in Bot. Jahrb. XXXIV. beibl. LXXV. 28 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 106 (1919).—Non Linnaeus.

Populus alba var. *tomentosa* Wesmael in Bull. Soc. Bot. Belg. XXVI. 373 (1887).—Burkill in Jour. Linn. Soc. XXVI. 535 (1899).

CHILI: near Peking, *E. Bretschneider;* same locality, *J. G. Jack*, October 7, 1905, *N. H. Cowdry*, no. 2154, November 15, 1920, and *J. Hers*, no. 2258, October 18, 1922; Yellow Temple near Peking, *C. S. Sargent*, September 16, 1903.—See also Carrière, l. c., Maximowicz, l. c., Burkill, l. c., and Schneider, l. c.

SHANTUNG: Tsingtau, *O. Nebel*, *R. Zimmermann*, no. 297 (ex Seemen, l. c. and ex Loesener, l. c.); near Chifu, cultivated (ex Franchet, l. c.).

HONAN: Kio shan, *L. H. Bailey*, June 22, 1917.—See also Bailey, l. c., and Hers, l. c.

SHENSI: northwest of Han cheng hsien, rare in district, *W. Purdom*, no. 377, 1910.

KANSU: Chu kun, planted along roadsides, *F. N. Meyer*, no. 1801, October 18, 1914; Tsing chow, Wu shih li pu, alt. 1500 m., *J. Hers*, no. 2410, July 4, 1922; Fu kiang hsien, alt. 1400 m., *J. Hers*, no. 2422, August 21, 1922; Anting hsien, Tsang ko chen, alt. 2100 m., *J. Hers*, no. 2426, August 26, 1922.

Meyer's no. 1801 from Kansu which is from a planted tree agrees with typical *P. tomentosa* from near Peking, while Hers' specimens from eastern Kansu all have smaller leaves and no. 2422 which consists of a young shoot has deeply lobed leaves white-tomentose beneath and looks much like *P. alba* as does Purdom's no. 377 from Shensi, but they have the glabrous or glabrescent winter-buds of *P. tomentosa*.

Possibly *P. tomentosa* is only an extreme form of *P. alba* L.

Populus laurifolia Ledebour, Fl. Alt. IV. 297 (1833).—Schneider in Sargent, Pl. Wilson. III. 35 (1916).

Populus balsamifera var. *laurifolia* Wesmael in De Candolle Prodr. XVI. pt. II. 330 (1868).—Burkill in Jour. Linn. Soc. XXVI. 535 (1899), ? in part.

Populus sp. Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922).

CHILI: banks of Lan ho River near Jehol, common, planted, *N. H. Cowdry*, no. 2155, November, 1920.—See also Burkill, l. c.

HONAN: Lu shih, Fan lin, alt. 600 m., *J. Hers*, no. 1100, October 15, 1919; Yung ning, Chung yang, *J. Hers*, no. 1128, October 18, 1919.—See also Hers, l. c.

DISTRIBUTION: also Siberia.

Not without hesitation I refer to *P. laurifolia* Cowdry's specimen from Chili and Hers' specimens from Honan. They consist of vigorous, strongly angled shoots with large ovate or elliptic-ovate to nearly oblong-ovate leaves 10–20 cm. long, distinctly broadest below the middle and rounded at base and borne on rather slender petioles 2–5 cm. long. Mr. Hers describes his no. 1100 as a tall tree with white and smooth bark, its wood superior to that of *P. suaveolens*, but inferior to that of *P. tomentosa* and the leaves as not edible, and of no. 1128 he says that it is called by the Chinese ku yang (= bitter poplar), because the leaves, though resembling those of *P. suaveolens*, are not edible.

Populus laurifolia differs from *P. suaveolens* Fisch. chiefly in the strongly angled shoots of light grayish brown or yellowish brown color and from *P. Simonii* Carr. in the larger leaves distinctly broadest below the middle and rounded or even slightly subcordate at the base and in the longer petioles. Schneider refers the specimens cited by Burkill under *P. balsamifera* var. *laurifolia* to *P. Simonii*, probably under the assumption that *P. laurifolia* does not occur in northern China and he may be right, but more complete material is needed to determine accurately the distribution of the Poplars of northeastern and eastern Asia.

Populus adenopoda Maximowicz in Bull. Soc. Nat. Moscou, LIX. 50 (1879).—Seemen in Bot. Jahrb. XXXIV. beibl. LXXV. 274 (1904).—Schneider in Sargent, Pl. Wilson. III. 23 (1916).—Bailey, Gent. Herb. I. 16 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 22 (1922).

Populus tremula var. *adenopoda* Burkill in Jour. Linn. Soc. XXVI. 537 (1899).

HONAN: Kio shan, in the hills, *L. H. Bailey*, June 24, 1917; Kio shan, planted in village, same collector and date; Yung ning, She pa pan, *J. Hers*, no. 846, October 7, 1919; Yung ning, Chang shui, *J. Hers*, nos. 1133, 1134, October 18 and 19, 1919.—See also Hers, l. c.

SHENSI: "ad fl. Han," *P. J. Piasezki* (ex Maximowicz, l. c., Burkill, l. c. and Seemen, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Kweichou, Hunan, Kiangsi, Kiangsu, Chekiang.

Populus tremula L. var. **Davidiana** Schneider in Sargent, Pl. Wilson. III. 23 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 22 (1922).

Populus venusta David, Jour. Trois. Voy. Chin. I. 294 (1875), nomen.

Populus tremula Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 94 (Pl. David I. 284) (1884).—Burkill in Jour. Linn. Soc. XXVI. 537 (1899).

CHILI: Weichang, *W. Purdom*, no. 11, 1910; Tung ling, grove near Temple, *N. H. Cowdry*, no. 1296, May 18, 1921; Wu tai shan, alt. 2000 m., *F. N. Meyer*, no. 1113, August 5, 1913; Hsiao wutai shan, Tieh ling, alt. 1300 m., *J. Hers*, no. 2134, October 7, 1922; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, no. 2087, October 4, 1922: Po hua shan, *J. Hers*, nos. 1417, 1419, May 1, 1921; without locality, *Père Chanet*, no. 80, 1918.—See also Franchet, l. c. and Burkill, l. c.

HONAN: Teng feng hsien, Yu tai shan, alt. 1500 m., *J. Hers*, no. 216, April 23, 1919; Yung ning, Tsi li ping, *J. Hers*, no. 461, May 22, 1919; Hwei hsien, Shang lieh kiang, *J. Hers*, no. 727, June 17, 1919; Lushih, Lao kiun shan, alt. 2000 m., *J. Hers*, no. 1224, September 21, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1707, September 18, 1921; without precise locality, *J. Hers*, no. 5, 1918.—See also Hers, l. c.

SHANSI: Hsi po po, *F. N. Meyer*, no. 1656, July 10, 1914; Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2020, September 7, 1922; Lin hsien, Nan yang shan, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2068, September 11, 1922.

SHENSI: Yenan fu, *W. Purdom*, no. 359, 1910; northwest of Han cheng hsien, *W. Purdom*, no. 1041, 1910; Lung chow, Li kia po, alt. 1400 m., *J. Hers*, no. 2380, July 4, 1922.

KANSU: *N. Przewalski* (ex Burkill, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Yunnan; Manchuria, Amur and Ussuri regions, Korea, Hokkaido.

Salix Wilsonii Seemen in Bot. Jahrb. XXXVI. beibl. LXXXII. 28 (1905).—Schneider in Sargent, Pl. Wilson. III. 40 (1916).—Hers in Jour. N.

China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 28 (1922).

HONAN: Yung ning, Tsi li ping, *J. Hers*, nos. 428, 436, May 22, 1919; Teng feng hsien, Yu tei shan, *J. Hers*, no. 254, April 23, 1919, no. 305, June 17, 1919.—See also Hers, l. c.

DISTRIBUTION: also Kiangsu, Chekiang, Hupeh, Kweichou.

The specimens are sterile except no. 436 which bears a remnant of a fruiting catkin.

Salix glandulosa Seemen in Bot. Jahrb. XXI. beibl. LIII. 55 (1896); XXIX. 276 (1900).—Schneider in Sargent, Pl. Wilson. III. 98 (1916); in Bailey, Gent. Herb. I. 17 (1920).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 106 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 27 (1922).

HONAN: Chi kung shan, *L. H. Bailey*, June 6 and 14, 1917; Lushih, Tang ho, alt. 1000 m., *J. Hers*, no. 952, October 11, 1919; without precise locality, *J. Hers*, no. 11, 1918.—See also Schneider, l. c. (1920) and Hers, l. c.

SHENSI: Ko lu pa, *G. Giraldi* (ex Seemen, l. c. [1900]).

DISTRIBUTION: also Korea, Japan.

The differences between *S. Wilsonii* and *S. glandulosa* seem to be very slight and both are possibly only forms of one species, as suggested already by Schneider (in Bailey, Gent. Herb. I. 17). Loesener enumerates (l. c.) also a *S. glandulosa* forma vel pl. hybrida collected at Haipo. The plant has one or mostly two stamens and may be a hybrid with a diandrous species.

Salix chikungensis Schneider in Bailey, Gent. Herb. I. 17, fig. 3, c, d (1920).

HONAN: Chi kung shan, *L. H. Bailey*, June 14, 1917.—See also Schneider, l. c.

Salix paraplesia Schneider in Sargent, Pl. Wilson. I. 40 (1916).—Hers, Liste Ess. Lign. Honan, 27 (1922).

Salix—Bailey, Gent. Herb. I. 18 (1920).

HONAN: Chi kung shan, *L. H. Bailey*, June 14, 1917; Lushih, Kiao ho, alt. 1000 m., *J. Hers*, no. 968, October 13, 1919; Yung ning, Chuan pao shan, alt. 1500 m., *J. Hers*, no. 1114, October 17, 1919; Sung hsien, Shih tze miao, *J. Hers*, no. 1251, September 25, 1919.—See also Bailey, l. c., and Hers, l. c.

SHANSI: Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers nos. 2024 (fruiting branch), 2025 (sterile).

SHENSI: Lung chow, Kuan shan, alt. 2000 m., *J. Hers*, no. 2336, July 3, 1922; Lung chow, Li kia po, alt. 1400 m., *J. Hers*, no. 2393, July 4, 1922.

Hers' no. 2024 from Shansi agrees perfectly with the type of *S. paraplesia* in the leaves and the fruiting catkins and also the sterile no. 2025 does not differ; no. 2393 from Shensi agrees in the fruiting catkins but the leaves

are narrower and the petioles and young branchlets puberulous. The specimens from Honan are all sterile and agree well with Wilson's no. 1441 from Hupeh doubtfully referred by Schneider to *S. paraplesia*, but Hers' nos. 968 and 1251 are furnished on the underside of the leaves with scattered appressed silky hairs and, while the original specimen of 1441 shows no trace of pubescence, plants cultivated in the Arnold Arboretum under Wilson's no. 1441 have the midrib beneath and the young branchlets often slightly pubescent.

Salix amygdalina Linnaeus, Spec. 1016 (1753).—Schneider in Sargent, Pl. Wilson. III. 106 (1916).

Salix triandra f. *submaritima* Debeaux in Act. Soc. Linn. Bordeaux, XXXI. 363 (Fl. Tché-foû, 130) (1877).

Salix amygdalina f. *subdiscolor* Debeaux in Act. Soc. Linn. Bordeaux, XXXIII. 64 (Fl. Tien-tsin, 41) (1879).

Salix triandra Linnaeus, Spec. 1016 (1753).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 255 (1884).—Burkill in Jour. Linn. Soc. XXVI. 533 (1899).

CHILI: near Tien tsin (ex Debeaux, l. c. [1879] and Burkill, l. c.).

SHANTUNG: near Chifu (ex Debeaux, l. c. [1877] and ex Burkill, l. c.).—See also Franchet, l. c.

In the absence of material from the region the determination of Debeaux' specimens remains doubtful.

Salix amygdalina L. var. **nipponica** Schneider in Sargent, Pl. Wilson. III. 106 (1916).

Salix triandra Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).

Salix triandra var. *nipponica* Seemen in Gilg & Loesener in Bot. Jahrb. XXXIV. beibl. LXXV. 27 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 106 (1919).

SHANTUNG: Tsingtau, Iltis mountain, *O. Nebel* (ex Seemen, l. c. and Loesener, l. c.).—See also Faber, l. c.

DISTRIBUTION: also Japan.

Salix Matsudana Koidzumi in Tokyo Bot. Mag. XXIX. 312 (1915).—Schneider in Sargent, Pl. Wilson. III. 107 (1916).—Bailey, Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 27 (1922).

Salix babylonica Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 135 (Enum. Pl. Chin. Bor. 61) (1833).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Debeaux in Act. Soc. Linn. Bordeaux, XXXI. 363 (Fl. Tché-foû, 130) (1877); XXXIII. 64 (Fl. Tien tsin, 41) (1879).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 254 (1884); in Nouv. Arch. Mus. Paris, sér. 2, VII. 92 (Pl. David. I. 282) (1884).—Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).—Burkill in Jour. Linn. Soc. XXVI. 526 (1899), quoad specimina cit. e Chili et Shantung.—Seemen in Bot. Jahrb. XXXIV. beibl. LXXV. 27 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 107 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922).—Non Linnaeus.

CHILI: Hsiao wu tai shan, southeastern valley, alt. 900–1500 m., *J. Hers*, no. 2189, October 9, 1922; Tientsin, near race course (also planted everywhere between Tientsin and Peking), *E. H. Wilson*, April, 1909

(male); Peking, *C. S. Sargent*, September 16, 1903 ("large tree with pendulous branches; the common Peking Willow"); Peking-Nankow road *J. H. Jack*, October 6, 1905 ("Common Willow of Peking plain; large tree"); Calceen wong, *W. Purdom*, no. 65, 1909 ("pendulous form;" in fruit); Hsia tien, *F. N. Meyer*, no. 935, May 25, 1913 (in fruit); Kalgan, *N. H. Cowdry*, no. 2156 ("smooth bark"), no. 2157 ("rough bark"), August, 1921; Tsung ling mountains, *N. H. Cowdry*, no. 1337, May 18, 1921; on road to Ku hei kow, *N. H. Cowdry*, no. 1338, May 13, 1921; Ming tombs, *J. Hers*, no. 1596, August 14, 1921.—See also Bunge, l. c., Debeaux, l. c. (1879), Franchet, l. c. (Pl. David.), Burkill, l. c., Schneider, l. c., and Bailey, l. c.

SHANTUNG: Chifu, *N. H. Cowdry*, no. 632, September 1, 1920; near Tsingtau (ex Seemen, l. c. and Loesener, l. c.).—See also Debeaux, l. c. (1877), Franchet, l. c. (Mém. Cherbourg), Burkill, l. c., and Faber, l. c.

HONAN: Cheng chow, *J. Hers*, no. 83, April 20, 1920 ("the common Willow of the plain;" in fruit); Fan lin, Lu shih, alt. 600 m., *J. Hers*, no. 850 (pendulous form); east of Kai fang, cultivated, *J. Hers*, no. 31, May 9, 1919; without precise locality and without no., *J. Hers*, 1919 ("the common Willow of north Honan").—See also Hers, l. c.

KANSU: Ran shiu, *E. Umemura*, No. 17 (type, ex Koidzumi, l. c.).

DISTRIBUTION: also Manchuria, Amur and Ussuri region, Transbaikalia.

This is the common Willow of Chili and northern Honan. The pendulous form of it which apparently takes in these regions the place of *S. babylonica* L. has been distinguished as f. *pendula* Schneider (in Bailey, Gent. Herb. 1. 18 [1920]) based on a specimen from a cultivated tree collected at Shanghai. In the collection of photographs of this Arboretum there is a photograph of a beautiful tree of this form at Fan lin, Lu shih, northern Honan, taken by J. Hers (specimens under no. 850) and a photograph taken on the Tchien shan in Manchuria by F. N. Meyer (specimens under no. 54). According to J. Hers, *S. Matsudana* is occasionally cultivated as a basket willow but is inferior to *S. purpurea*.

Salix cupularis (Sect. Sclerophyllae), sp. nov.

Frutex ad videtur parvus erectus ramulis brevibus ab initio glabris; ramuli annotini fusco-purpurei, vetustiores cortice fisso vel secedente flavescente partim flavidi vel flavo-grisei et cicatricibus ramulorum fruciferorum delapsorum nodosi. Folia graciliter petiolata, elliptica vel obovato-elliptica, 1.5–2.5 cm. longa, apice obtusa et apiculata vel acutiuscula, basi late cuneata vel interdum rotundata, integra, supra obscura viridia, subtus glaucescentia, glaberrima, subchartacea, utrinque nervis 6–9 leviter elevatis, venulis vix conspicuis vel obsoletis; petioli graciles, 0.5–1 cm. longi, flavescentes; stipulae minimae, suborbiculares, circiter 5 mm. longae, crassiusculae. Amenta feminea in apice ramulorum brevium 0.5–1 cm. longorum folia plura normalia gerentia, circiter 1 cm. longa et 6–8 mm. crassa (fructibus immaturis); ovaria brevissime pedicellata, elongato-

ovata, apice sensim attenuata, glabra, stylo gracili circiter 1 mm. longo, apice bifido, stigmatibus angustis bifidis stylo multo brevioribus; rhachis inter ovaria sparse villosa; bracteae ovatae vel late obovatae, apice rotundatae, 1–2 mm. longae, extus et margine glabrae vel interdum basin versus pilis paucis longis ciliatae, intus basin versus laxe longeque sericeo-pilosae; glandulae duae, valde variabiles, basi plus minusve connatae et pseudo-discum formantes, ventralis plerumque bifida vel bipartita, vel indivisa et ovato-oblonga, rarius 3-partita, pedicellum ovarii aequans vel paullo superans, dorsalis plerumque oblonga, rarius brevior et quadrangularis vel leviter bifida.

SHENSI: Tai pei shan, alt. 3300 m., *W. Purdom*, no. 547, 1910.

This new species is very distinct and well characterized by its low habit, short thick glabrous branchlets, small slender-petioled elliptic entire and quite glabrous leaves glaucescent beneath, by the ovoid female catkins on short leafy branchlets with glabrous ovaries and glabrous bracts and by the presence of two glands connected at the base into a kind of a disk or cupula surrounding the base of the very short pedicel of the ovary; the ventral gland is usually 2- or sometimes 3-parted, while the dorsal one is undivided. It is apparently most closely related to *Salix oritrepha* Schneider, but easily distinguished by the glabrousness of all its parts.

Mixed with the specimens of the type there is a form with pubescent ovaries but otherwise exactly like the type which may be distinguished as:

Salix cupularis var. **lasiogyne**, var. nov.

At typo recedit ovariis subaccumbenti-villosis pilis rufescenti-cinereis, micantibus.

SHENSI: Tai pei shan, alt. 3300 m., *W. Purdom*, no. 547 (mixta cum typo), 1910.

In its pubescent ovaries this variety resembles *S. oritrepha* Schneider but the branchlets, leaves and bracts are perfectly glabrous as they are in the type, while in *S. oritrepha* all parts of the plant are more or less pubescent at least while young.

Salix spathulifolia Seemen in Bot. Jahrb. XXXVI. beibl. LXXXII. 31 (1905).—Schneider in Sargent, Pl. Wilson. III. 114 (1916).

SHENSI: Huan tou shan, *G. Giraldi*, no. 5359 (type, ex Seemen, l. c.); Tai pei shan, *W. Purdom*, no. 1109, 1910.

Purdom's specimen which is in mature fruit agrees fairly well with the original description, but the leaves are comparatively broader, about 3.5 cm. broad, and oblong, scarcely spatulate.

Salix Biondiana Seemen in Bot. Jahrb. XXXVI. beibl. LXXXII. 32 (1905).—Schneider in Sargent, Pl. Wilson. III. 118 (1916).

SHENSI: Pao ki scen, Miao wang shan, *Hugh Scallan* in Giraldi, no. 5361 (type, ex Seemen, l. c.).

DISTRIBUTION: also Hupeh.

Salix hypoleuca Seemen in Bot. Jahrb. XXXVI. beibl. LXXXII. 31 (1905).—Schneider in Sargent, Pl. Wilson. III. 53 (1916).

SHENSI: In kia pu, Lao y san, *G. Giraldi*, no. 5362 (type, ex Seemen, l. c.); Lao y san, *G. Giraldi*, June 4, 1897.

DISTRIBUTION: also Hupeh, Szechuan.

Salix heterochroma Seemen in Bot. Jahrb. XXI. beibl. LIII. 56 (1896).—Schneider in Sargent, Pl. Wilson. III. 61 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 27 (1922).

HONAN: Lu shih, Hiung eul shan, alt. 1400 m., *J. Hers*, no. 935, October 10, 1919.—See also Hers, l. c.

DISTRIBUTION: also Hupeh, Szechuan.

As the Honan specimen is sterile it cannot be identified with absolute certainty, but I cannot detect any difference in the leaves and branches of these specimens and those of *S. heterochroma* from Hupeh and from plants cultivated in this Arboretum.

Salix phylicifolia Linnaeus, Spec. 1016 (1753), excl. var. β.—Hance in Jour. Bot. XIII. 137 (1875).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 93 (Pl. David. I. 283) (1884).—Burkill in Jour. Linn. Soc. XXVI. 532 (1899).—Schneider in Sargent, Pl. Wilson. III. 123 (1916).—Hers, Liste Ess. Lign. Honan, 27 (1922).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 353 (1922).

CHILI: Hsiao wu tai shan, alt. 2300 m., *F. N. Meyer*, no. 1204, Aug. 12, 1913, no. 1248, August 20, 1913; Hsiao wu tai shan, Tieh ling, alt. 1300 m., *J. Hers*, no. 2139, October 7, 1922; Hsiao wu tai shan, Shui shih tao, alt. 1500 m., *J. Hers*, no. 2162, October 8, 1922; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, No. 2086, October 4, 1922.—See also Hance, l. c., Franchet, l. c., Burkill, l. c., and Limpricht, l. c.

HONAN: Lu shih, Liao kiun shan, alt. 2200 m., *J. Hers*, no. 1203, September 21, 1919.—See also Hers, l. c.

SHANSI: Hia hsien, Huang la'i kow, *J. Hers*, no. 1830, October 2, 1921; Lin hsien, Nan yang shan, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2070, September 11, 1922.

DISTRIBUTION: also northeastern Asia to Caucasus and Europe.

All the specimens quoted are sterile and their identification is therefore open to doubt, as is the identification of all specimens from northeastern Asia with *S. phylicifolia* L. which may be restricted to Europe and western Asia.

Salix characta Schneider in Sargent, Pl. Wilson. III. 125 (1916).

CHILI: Hsiao wu tai shan, mountain slopes, alt. 1700–3000 m., *F. N. Meyer*, no. 1160 (type), August 8, 1913.—See also Schneider, l. c.

Salix Baileyi Schneider in Bailey, Gent. Herb. I. 16, fig. 3 a, b, 1920.

HONAN: Chi kung shan, alt. 500–800 m., *L. H. Bailey*, June 16, 1917 (type).—See also Schneider, l. c.

Salix Caprea Linnaeus, Spec. 1020 (1753), excl. var. γ et δ.—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 93 (Pl. David. I. 283) (1884).—Burkill in Jour. Linn. Soc. XXVI. 527 (1899).—Seemen in Bot. Jahrb. XXIX. 277 (1900).—Schneider in Sargent, Pl. Wilson. III. 149 (1916).

CHILI: Hsiao wu tai shan, well-wooded mountain slopes, alt. 1600–2600 m., *F. N. Meyer*, no. 1248, August 20, 1903; Weichang, *W. Purdom*, no. 79, 1909.—See also Schneider, l. c.

SHENSI: Tsin ling, *A. David* (ex Franchet, l. c., Burkill, l. c., Seemen, l. c., Schneider, l. c.); Kiu lin shan, *G. Giraldi*, no. 1160 (ex Seemen, l. c., Schneider, l. c.).

DISTRIBUTION: also Japan and northeastern Asia to Europe.

Both specimens cited from Chili are sterile and their identification will remain doubtful until more complete material from eastern Asia is available.

? Salix Caprea × phylicifolia Burkill in Jour. Linn. Soc. XXVI. 527 (1899).

CHILI: Jehol, *A. David*, no. 1690 (in herb. Paris, ex Burkill, l. c.).

Salix Wallichiana Andersson in Svensk. Vetensk. Akad. Handl. 1850, 477 (1851).—Schneider in Sargent, Pl. Wilson. III. 64 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922); Liste Ess. Lign. Honan, 28 (1922).

Salix Wallichiana var. *grisea* Andersson in Svensk. Vetensk. Akad. Handl. VI. 80 (Monog. Salic.) (1867).—Seemen in Bot. Jahrb. XXIX. 277 (1900).

CHILI: Po hua shan, *J. Hers*, no. 1677, September 9, 1921.

HONAN: Lu shih, Hiung eul shan, alt. 1400 m., *J. Hers*, no. 918, October 10, 1919; Lu shih, Kiao ho, alt. 1000 m., *J. Hers*, no. 978, October 13, 1919; Lushih, Tung ho, alt. 1000 m., *J. Hers*, no 990, October 14, 1919; Lu shih, Lao kiun shan, alt. 900 m., *J. Hers*, no. 1190, September 21, 1919; no. 1237, September 23, 1919; Yung ning, Chuan pao shan, alt. 1500 m., *J. Hers*, no. 1120, October 7, 1919; Yung ning, Tsi li ping, alt. 1000 m., *J. Hers*, no. 1367, September 30, 1919; Sung hsien, San kuan miao, alt. 1000 m., *J. Hers*, nos. 516, 560, May 24, 1919, and no. 1309, September 27, 1919; Teng feng hsien, Yu tai shan, alt. 1500 m., *J. Hers*, no. 218, April 23, 1919 (flowers) and no. 316, April 20, 1920 (in fruit).—See also Hers, l. c.

SHENSI: Tsin ling shan, *A. David* (ex Seemen, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Kweichou, Yunnan, northwestern Himalayas and eastern Afghanistan.

This is a very variable species, the leaves varying from tomentose on their under side to nearly glabrous, but the majority of the specimens cited above have leaves more or less tomentose below, except no. 1190 from Lao kuan shan which is only slightly pubescent on the midrib beneath. *Salix Wallichiana* is apparently closely related to *S. Caprea* and I am

not at all sure whether all the specimens cited above belong to this species or partly to *S. Caprea* or some other closely related species. Unfortunately all the specimens except nos. 218 and 316 are sterile.

Salix Wallichiana Anderss. var. ?

CHILI: Hsiao wu tai shan, *J. Hers*, no. 1497, July 14, 1921 and no. 1568, July 16, 1921; Po hua shan, *J. Hers*, nos. 1402 and 1405 (both in flower), May 1, 1921; no. 1444, July 1, 1921; without precise locality, *Père Chanet*, nos. 16, 45 (in fruit), 54, 1918.

HONAN: Lu shih, Hiung eul shan, alt. 1400 m., *J. Hers*, no. 886, October 10, 1919; Tsi yuán hsien, Tien tan shan, *J. Hers*, no. 1698, September 16, 1921.

The specimens cited represent apparently a form of *S. Wallichiana* with smaller glabrescent or glabrous leaves mostly elliptic-oblong and rarely more than 8 cm. long, and with smaller and slenderer fruiting catkins. They have some resemblance to *S. Starkeana* Willdenow but that species has smaller and comparatively broader leaves distinctly reticulate beneath and borne on very short petioles; it has, too, smaller catkins with long-villose paler bracts.

Salix viminalis Linnaeus, Spec. 1021 (1753).—Schneider in Sargent' Pl. Wilson. III. 157 (1916).

CHILI: Hsiao wu tai shan, *J. Hers*, no. 1493, July 14, 1921; Huai lai hsien, Yang kia ping, *J. Hers*, no. 2113, October 4, 1922.

DISTRIBUTION: also northeastern Asia to Europe, and in the Punjab and Kashmir.

This species has not yet been recorded from China, but although the specimen is sterile, I have little doubt that it belongs to *S. viminalis*, as it agrees perfectly in the shape and pubescence of the leaves with European specimens of that species.

Salix purpurea Linnaeus, Spec. 1017 (1753).—Debeaux in Act. Soc. Linn. Bordeaux, XXXI. 111 (Fl. Tché-foû, 16) (1877).—Franchet in Mém. Soc. Nat. Cherbourg, XXIV. 255 (1884).—Burkill in Jour. Linn. Soc. XXVI. 532 (1899).

Salix purpurea var. v. forma Loesener in Beih. Bot. Centralbl. XXXVIII. abt. II. 107 (1919).

SHANTUNG: near Chifu (ex Debeaux, l. c., Franchet, l. c. and Burkill, l. c.).—See also Loesener, l. c.

DISTRIBUTION: also Siberia and central Asia to Europe.

Salix purpurea L. var. **stipularis** Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 91 (Pl. David. I. 284) (1884).—Schneider in Sargent, Pl. Wilson. III. 168 (1916).

Salix purpurea var. *multinervis* Hers in Jour. N. China Branch R. As. Soc. LIII. 115 (1922).

Salix purpurea var. Hers, l. c. 115 (1922); Liste Ess. Lign. Honan, 28 (1922).

CHILI: near Yu tien hsien, cultivated and wild, *F. N. Meyer*, no. 941, May 26, 1913; Po hua shan, *J. Hers*, no. 1648, September 9, 1921 (doubtful).

HONAN: Cultivated on the sandy marshy plain east of Kai feng, *J. Hers*, no. 30, May 9, 1919.

SHANSI: Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2026, September 7, 1922.

DISTRIBUTION: also Mongolia.

I am not sure if the specimens cited above are really refereable to Franchet's variety, as his description is rather incomplete. The leaves are attenuate, 10–15 cm. long and 1–1.5 cm. wide, short-petioled, cuneate at the base, abruptly acute at the apex, serrulate, rather remotely so toward the base, and glabrous; the stipules are well-developed, lanceolate or oblong-lanceolate and longer than the petioles in the specimens from Chili and Honan. This Willow is according to Hers extensively cultivated near Kai feng and is apparently the chief basket Willow of northern China.

There is a specimen from Po hua shan, Chili, collected by J. Hers under no. 1648, consisting only of vigorous sterile shoots which may represent a form of *S. purpurea;* the leaves are nearly as long as those of the var. *stipularis* but up to 3 cm. broad, and the stipules are small and semicordate.

Salix cheilophila Schneider in Sargent, Pl. Wilson. III. 69 (1916).

CHILI: Po hua shan, *J. Hers*, no. 1459, July 1, 1921; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, no. 2085, October 4, 1922.

HONAN: Lu shih, Kiao ho, very common, alt. 1000 m., *J. Hers*, no. 963, October 12, 1919 (up to 4 m. tall); Hwei hsien, Shansi border, *J. Hers*, No. 712, June 19, 1919.

SHANSI: Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2023, September 7, 1922.

DISTRIBUTION: also Szechuan.

As far as can be judged from the sterile specimens cited above, they are identical with *S. cheilophila* from western Szechuan, though it is possible that they represent a silky-pubescent form of *S. purpurea* L. different from var. *sericea* Koch.

Salix melea Schneider in Sargent, Pl. Wilson. III. 176 (1916).

NORTHERN CHINA: without locality, *W. Purdom*, 1909–1911 (type).—See also Schneider, l. c.

Salix spec.

CHILI: Hsiao wu tai shan, Tieh ling, alt. 1300 m., *J. Hers*, no. 2120, October 7, 1922.

A sterile branch with short-petioled oblong-lanceolate leaves 8–9 cm. long, strongly glandular-dentate, glabrous, glaucescent beneath.

Salix spec.

SHENSI: Tai pei shan, *W. Purdom*, no. 979, 1910.

HONAN: Hwei hsien, Shansi border, *J. Hers*, no. 705, June 19, 1919.

In its leaves and the slender short-peduncled fruiting catkins with sessile fruits, Purdom's specimen very much resembles *S. rhoophila* Schneid. and *S. polyclona* Schneid. from Hupeh, but the capsules are pubescent, the style is short as in *S. polyclona*. Hers' specimen which is sterile differs only slightly in its leaves.

Another *Salix spec.*, possibly a new species from the Wu tai shan, Shansi, is mentioned by Limpricht (Bot. Reis. Hochgeb. China Ost-Tib. 354 [1922]).

JUGLANDACEAE

Platycarya strobilacea Siebold & Zuccarini in Abh. Akad. Muench. III. 742, t. 5, fig. 1 (1843).—Pritzel in Bot. Jahrb. XXIX. 273 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. III. 180 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 21 (1922).

HONAN: Yung ning, Tsi li ping, *J. Hers*, no. 465, May 22, 1919; Lu shih, Lao kiun shan, alt. 2000 m., *J. Hers*, no. 1149, September 21, 1919.—See also Hers, l. c.

SHENSI: Lun san huo, *G. Giraldi*, nos. 1268, 1520 (ex Pritzel, l. c.).

DISTRIBUTION: also Kiangsu, Chekiang, Kiangsi, Kwangtung, Hupeh, Yunnan; Korea, Japan.

Pterocarya stenoptera C. De Candolle in Ann. Sci. Nat. sér. 4, XVIII. 34 (1862).—Skan in Jour. Linn. Soc. XXVI. 494 (1899).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 28 (1904).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 33 (1905).—Rehder & Wilson in Sargent, Pl. Wilson. III. 181 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922).

Pterocarya stenoptera var. *typica* Franchet in Jour. de Bot. XII. 317 (1898).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 107 (1919).

SHANTUNG: Lau shan, *O. Nebel* (ex Gilg, l. c.).

SHENSI: *J. P. Piasezki* (ex Skan, l. c.); Hua tzo pin, *G. Giraldi*, no. 3865 (ex Diels, l. c.).

KANSU: *J. G. Piasezki* (ex Skan, l. c.).

DISTRIBUTION: from northern China south to Kwangtung and Tonkin, west to Yunnan and Szechuan.

The enumeration of this species by Hers (l. c.) among the Honan plants is probably a mistake and refers to his no. 1018 from Kiangsu.

Pterocarya stenoptera β. **kouitchensis** Franchet in Jour. de Bot. XII. 318 (1898).—Loesener in Beih. Bot. Centralbl. XXXVII, abt. II. 107 (1919).

SHANTUNG: Tsingtau (ex Loesener, l. c.).

DISTRIBUTION: also Kweichou.

Pterocarya hupehensis Skan in Jour. Linn. Soc. XXVI. 493 (1899).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 33 (1905).—Rehder & Wilson

in Pl. Wilson. III. 182 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII, 144 (1922); Liste Ess. Lign. Honan, 23 (1922).

?*Pterocarya Paliurus* Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); non Batalin.

HONAN: Yung ning, Chuan pao shan, alt. 1500 m., *J. Hers*, no. 1121, October 17, 1919; Lu shih, Tang ho, *J. Hers*, no. 956, October 11, 1919.—See also Hers, l. c.

SHENSI: Lao y shan, *G. Giraldi* (ex Diels, l. c.).

DISTRIBUTION: also Hupeh, Szechuan.

Mr. Hers' no. 956 is from an enormous tree, the trunk measuring 4 m. in girth, and dividing at the height of 3 m. into many strong branches covering a radius of 30 m.

Pterocarya macroptera Batalin in Act. Hort. Petrop. XIII. 100 (1893).—Skan in Jour. Linn. Soc. XXVI. 494 (1899).

KANSU: Id shu shan, *G. N. Potanin* (ex Batalin, l. c., and Skan, l. c.).

Pterocarya rhoifolia Siebold & Zuccarini in Abh. Akad. Muench. IV. pt. 2, 141 (1846).—Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 28 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 107 (1919).

SHANTUNG: see Faber, l. c., ex Gilg, l. c. and Loesener, l. c.

DISTRIBUTION: Japan.

This species is otherwise not known from China and its occurrence in Shantung is very doubtful. There are no specimens of Faber's of this species in the Berlin Herbarium.

Juglans regia Linnaeus, Spec. 997 (1753).—Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 136 (Enum. Pl. Chin. Bor. 62) (1833).—Hance in Jour. Bot. XIII. 135 (1875).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 254 (1884).—Skan in Jour. Linn. Soc. XXVI. 493 (1899).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 28 (1904).—Rehder & Wilson in Sargent, Pl. Wilson. III. 184 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 107 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII. 111 (1922).

Juglans regia var. *sinensis* C. De Candolle in Ann. Sci. Nat. sér. 4, XVIII. 33, t. 4, fig. 38, 39 (1862).—Maximowicz in Bull. Acad. Sci. St. Pétersb. sér. 3, XVIII. 57 (1873); in Mél. Biol. VIII. 630 (1873).—Debeaux in Act. Soc. Linn. Bordeaux, XXXIII. 63 (Fl. Tien-tsin, 40) (1879).—Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).—Skan in Jour. Linn. Soc. XXVI. 493 (1899).—Hers, Liste Ess. Lign. Honan, 16 (1922).

CHILI: Ming tombs, north of Peking, *J. G. Jack*, October 6, 1905; Kalgan road, hills near Great Wall, *J. G. Jack*, October 5, 1905; near Changli, *F. N. Meyer*, no. 198, October, 1905.—See also Bunge, l. c., Maximowicz, l. c., Skan, l. c., Rehder & Wilson, l. c.

SHANTUNG: Lau shan, *O. Nebel* (ex Gilg, l. c. and Loesener, l. c.).—See also Franchet, l. c. and Faber, l. c.

HONAN: See Hers, l. c.

DISTRIBUTION: western Asia, extensively cultivated in Europe and Asia.

In China the fruit of this species is as variable as it is in Europe; it varies in its shape from subglobose to oblong-ovoid and in size from 2 cm. to more than 4 cm. long and it also varies in the thickness of the shell.

Juglans mandschurica Maximowicz in Bull. Phys.-Math. Acad. St. Pétersb. XV. 127 (1856).—Hance in Jour. Bot. XIII. 135 (1875).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 92 (Pl. David. I. 282) (1884).—Skan in Jour. Linn. Soc. XXVI. 493 (1899).

Juglans sp. Hers in Jour. N. China Branch R. As. Soc. LIII. 111 (1922).

CHILI: Huai lai shan, Yang kia ping, alt. 900 m., J. Hers, no. 2101, Oct. 4, 1922; Po hua shan, *J. Hers*, no. 1391, May 1, 1921; Nankow Pass, *J. Hers*, no. 1608, August 15, 1921; Weichang, *W. Purdom*, no. 90, 1909; Hsiao wu tai shan, *F. H. Meyer*, no. 1308, August 23, 1913; same locality, *J. Hers*, no. 1548, July 14, 1921; Peking, western hills, *J. Hers*, no. 2250, October 14, 1922.—See Franchet, l. c., Skan, l. c.

HONAN: Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1711, September 20, 1921; Lu shih, Hiung eul shan, alt. 1400 m., *J. Hers*, no. 892, October 10, 1919.

DISTRIBUTION: also Manchuria, Korea.

I have seen no fruits of typical *J. mandshurica* from northern China. Fruits from near Nankow Pass purchased by Hers and sent under No. 2467 are apparently intermediate between those of *J. mandshurica* and *J. Sieboldiana;* they are small, between 2 and 3 cm. long, and globose-ovoid to ovoid, some of them are nearly smooth, almost like those of *J. Sieboldiana*, while some are distinctly ribbed and deeply pitted with ragged edges like those of *J. mandshurica*, but most are intermediate between the two extremes. Under no. 2250 Mr. Hers sent leaf specimens and fruits from northwestern Chili; the leaves agree exactly with those of *J. mandshurica*, but the fruits are large, globose-ovoid to oblong-ovoid, up to 4 cm. long, with irregular and often indistinct longitudinal ridges and are deeply and irregularly pitted with rounded smooth edges. Nuts purchased in Peking and sent under no. 2254 are similar; Mr. Hers states that they are called "mahe tao" (horse nuts), take a fine polish and are used as trinkets. Nuts received about 1880 from Dr. Bretschneider as *J. manshurica* are also similar but much less distinctly ridged and pitted. Under no. 2101 Mr. Hers has sent leaf specimens and also fruits which are very much like small nuts of *J. Sieboldiana* but these were, according to his note, only those left on the ground after all the big nuts had been gathered by the natives. Possibly *J. mandshurica* and *J. Sieboldiana* Maxim. are only forms of one species exceedingly variable in its fruit. Certainly except in the configuration of the shell of the nut no characters have been discovered to distinguish *J. mandshurica* and *J. Sieboldiana.*

BETULACEAE

Ostryopsis Davidiana Decaisne in Bull. Soc. Bot. France, xx. 155 (1873).—Hance in Jour. Bot. xiii. 137 (1875).—Maximowicz in Mél. Biol. xi. 316 (1881); in Bull. Acad. Sci. St. Pétersb. xxvii. 535 (1882).—Palibin in Act. Hort. Petrop. xiv. 140 (1895).—Burkill in Jour. Linn. Soc. xxvi. 502 (1899).—Winkler in Engler, Pflanzenr. iv–61, 20, fig. 5 (1904).—Schneider in Sargent, Pl. Wilson. ii. 423 (1916).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. xxxvii. 58, no. 36731 (1916).—Hers in Jour. N. China Branch R. As. Soc. liii. 112 (1922); Liste Ess. Lign. Honan, 20 (1922).

Corylus Davidiana Baillon, Hist. Pl. vi. 224, fig. 174 (1877).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, vii. 88 (Pl. David. i. 278) (1884).

Chili: Weichang, alt. 4500 ft., *W. Purdom*, no. 3 (1909); Calceen wong, *W. Purdom*, no. 69, 1910; Kalgan, *N. H. Cowdry*, no. 1379, June 2, 1921; Po hua shan, *J. Hers*, no. 1450, July 1, 1921; Hsiao wu tai shan, *F. N. Meyer*, no. 1125, August 8, 1913; *N. H. Cowdry*, no. 1660, July 13, 1921; Hsiao wu tai shan, Tieh ling, alt. 1300 m. *J. Hers*, no. 2143, October 7, 1922.—See also Decaisne, l. c., Hance, l. c., Maximowicz, l. c., Franchet, l. c., Palibin, l. c., Burkill, l. c., Winkler, l. c., Schneider, l. c., and Meyer, l. c.

Honan: Hwei hsien, Shansi border, *J. Hers*, no. 703, June 19, 1919.—See also Hers, l. c.

Shansi: Wu chai hsien, Ta nan kow, 2000–3000 m., *Tchuang Kieh*, Hers no. 2006, September 7, 1922.

Shensi: Yenan fu district, *W. Purdom*, no. 384, 1910.—See also Winkler, l. c.

Kansu: Near Lau tschen, valley of Hoangho, *P. J. Piasezki* (ex Maximowicz, l. c., and Burkill, l. c.).

Distribution: also northwestern Szechuan.

Carpinus cordata Blume, Mus. Bot. Lugd.-Bat. i. 309 (1850).—Burkill in Jour. Linn. Soc. xxvi. 501 (1899).—Diels in Bot. Jahrb. xxix. 279 (1900).—Schneider in Sargent, Pl. Wilson. ii. 435 (1916).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 354 (1922).

Carpinus cordata var. *sinensis* Hers in Jour. N. China Branch R. As. Soc. liii. 107 (1922); Liste Ess. Lign. Honan, 6 (1922); non var. *chinensis* Franchet.

Chili: Jehol, *W. Limpricht* (ex Limpricht, l. c.)

Honan: Sung hsien, Sih tze miao, *J. Hers*, no. 567, May 26, 1919; Sung hsien, San kuan miao, *J. Hers*, no. 553, May 24, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1788, Sept. 21, 1919; Lao kiun shan, alt. 1500–2000 m., *J. Hers*, no. 1174, Sept. 21, 1919; Lu shih, Hiung eul shan, alt. 1400 m., *J. Hers*, no. 907, October 10, 1919. See also Hers, l. c.

Shensi: Kin tu san, *G. Giraldi*, July 14, 1897; Kuan yen tang, *F. N. Meyer*, no. 1921, Sept. 15, 1914; Lung chow, Sien fo shan, alt. 1000 m., *J. Hers*, no. 2322, July 2, 1922.—See also Burkill, l. c., Diels, l. c., and Schneider, l. c.

DISTRIBUTION: also Hupeh, Manchuria, Japan.

Carpinus cordata var. *chinensis* Franch. does not seem to occur in northern China, but it is common in Hupeh.

Carpinus Turczaninovii Hance in Jour. Linn. Soc. x. 203 (1869).—Maximowicz in Mél. Biol. xi. 315 (1881); in Bull. Acad. Sci. St. Pétersb. xxvii. 535 (1882).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, xxiv. 254 (1884); in Nouv. Arch. Mus. Paris, sér. 2, vii. 88 (Pl. David. i. 278) (1884).—Burkill in Jour. Linn. Soc. xxvi. 502 (1899).—Diels in Bot. Jahrb. xxix. 279 (1900).—Schneider in Sargent, Pl. Wilson. ii. 439 (1916).

Carpinus spec. Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. ix. 477 (Ind. Fl. Pekin.) (1859).

Carpinus stipulata Winkler in Engler, Pflanzenr. iv.-61, 35, fig. 11 (1904).

? *Carpinus spec.* Bailey, Gent. Herb. i. 18 (1920).

CHILI: Ta miao, *J. Hers*, no. 2210, October 10, 1922; Peking, western hills, alt. 700 m., *J. Hers*, no. 2224, October 11, 1922; near Peking, *S. W. Williams* (ex Schneider, l. c.); Po hua shan, *J. Hers*, no. 1657, September 9, 1921 (sterile); Tung ling hills north of wall, *N. H. Cowdry*, no. 1318, May 18, 1921; Tung ling, Pan shan, *N. H. Cowdry*, no. 1317, May 16, 1921; without locality, *Père Chanet* (sterile).—See also Hance, l. c., Maximowicz, l. c., Franchet, l. c. (Pl. David.), Burkill, l. c., Schneider, l. c.

SHANTUNG: Po shan, on rocky mountain sides, *F. N. Meyer*, no. 258, September 19, 1907.—See also Franchet, l. c. (Mém. Cherbourg), Burkill, l. c. and Schneider, l. c.

HONAN: Tsi yuan hsien, Tien tan shan, *J. Hers*, nos. 1695, 1885, 1886, September 16 and 21, 1921; Sung hsien, Shih tze miao, alt. 1200 m., *J. Hers*, No. 1258, September 25, 1919; Lu shih, Lao kiun shan, alt. 2000 m., *J. Hers*, September 21, 1919; alt. 900 m., *J. Hers*, no. 1238, September 23, 1919; Yung ning, Tsi li ping, *J. Hers*, nos. 1350 and 1329 (sterile), September 30, 1919; Hwei hsien, Shansi border, *J. Hers*, no. 799 and 757 (sterile), June 19, 1919; Ho dien, alt. 2500 -t., *F. N. Meyer*, no. 1861, July 7, 1914; Chi king shan, *L. H. Bailey*, July 30, 1917 (sterile, doubtful).

SHANSI: Hsi po po, *F. N. Meyer*, no. 1654, July 10, 1914 (Herb. U. S. Dept. Agric.).

SHENSI: Tai pei shan, *W. Purdom*, no. 994, 1910; without locality, *G. Giraldi*.—See also Burkill, l. c., Diels, l. c., Winkler, l. c., and Schneider, l. c.

DISTRIBUTION: also Korea, Manchuria.

Some of the sterile material is doubtful. Hers' no. 1329 is represented by a vigorous shoot with rather large pubescent leaves densely pubescent petioles and branchlets which might be taken for *C. Tschonoskii* Maxim., but its leaves lack the acuminulate teeth of that species; Bailey's specimens from Chi kung shan has the larger and narrower leaves of *C. Fargesiana* Winkl. and may be referable to that species.

Carpinus Turczaninovii var. **ovalifolia** Winkler in Bot. Jahrb. l. Suppl. 505 (1914).—Schneider in Sargent, Pl. Wilson. ii. 427 (1916).—Hers in

Jour. N. China Branch, R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 6 (1922).

HONAN: Sung hsien, San kuan miao, alt. 1200 m., *J. Hers*, nos. 508, 518, May 24, 1919.—See also Hers, l. c.

KANSU: Lotani road from Min chou, alt. 2600 m., *W. Purdom*, 1910; Chi shan near Cheng hsien, *F. N. Meyer*, no. 1763, October 1, 1914.—See also Schneider, l. c.

DISTRIBUTION: also Szechuan, Yunnan (*Handel-Mazzetti*, No. 10222, sterile).

This variety differs little from the type except in the dentate, not lobulate, fruiting bracts, and sterile specimens cannot be determined with certainty, although I refer Meyer's no. 1763 which represents a form with the leaves pubescent on both sides and Handel-Mazzetti's no. 10222 to the variety for geographical reasons.

Carpinus Fargesiana Winkler in Bot. Jahrb. L. suppl. 506, fig. 6 (1914).—Schneider in Sargent Pl. Wilson. II. 428 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 6 (1922).

HONAN: Mien chih, alt. 800 m., *J. Hers*, no. 79, Nov. 1, 1919; Lu shih, Tang ho, alt. 1000 m., *J. Hers*, no. 945, October 11, 1919; Sung hsien, Shih tze miao, alt. 1200 m., *J. Hers*, nos. 1270 and 1276 (sterile), September 25, 1919.—See also Hers, l. c.

SHANSI: Hia hsien, Huang lai kow, *J. Hers*, no. 1871, October 2, 1921; Hia hsien, Low shan, *J. Hers*, no. 1878, October 3, 1921.

KANSU: near Yan fu ko, *F. N. Meyer*, no. 1967, October 6, 1914.

DISTRIBUTION: also Chekiang (*F. N. Meyer*, no. 1542), Szechuan, Kweichou (*Handel-Mazzetti*, no. 10549).

F. N. Meyer's no. 1542 (sterile), from near Chang hua, Chekiang, referred by Schneider (l. c. 441) to *C. Tschonoskii* Maxim., probably belongs here.

Ostrya japonica Sargent in Gard. & Forest, VI. 383, fig. 58 (1893).—Schneider in Sargent, Pl. Wilson, II. 424 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 112 (1922); Liste Ess. Lign. Honan, 6 (1922).

HONAN: Lu shih, Lao kiun shan, *J. Hers*, no. 1141, September 21, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1807, September 21, 1921.—See also Hers, l. c.

DISTRIBUTION: also Hupeh, Szechuan; Korea, Japan.

Corylus tibetica Batalin in Act. Hort. Petrop. XIII. 102 (1893).—Schneider in Sargent, Pl. Wilson. II. 443 (1916);—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XLII. 36, no. 39909 (1918).

Corylus ferox var. *tibetica* Franchet in Jour. de Bot. XIII. 200 (1899).—Burkill in Jour. Linn. Soc. XXVI. 503 (1899).—Diels in Bot. Jahrb. XXIX. 281 (1900).

SHENSI: Tai pei shan, *W. Purdom*, no. 457, 1910.—See also Burkill, l. c.

KANSU: near Pao dji, *F. N. Meyer*, nos. 1819, 2004, November 7, 1914 (Herb. U. S. Dept. Agric.); valley of the river Tshagon, *G. N. Potanin* (ex Batalin, l. c., Burkill, l. c., and Schneider, l. c.).—See also Meyer, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan.

Corylus chinensis Franchet in Jour. de Bot. XIII. 197 (1899).—Meyer in U. S. Dept. of Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XLII. 36, no. 39907 (1918).

KANSU: near Kagoba, *F. N. Meyer*, no. 1992, October 30, 1914 (Herb. U. S. Dept. Agric.).—See also Meyer, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan.

According to Meyer's rather fragmentary specimen his determination is correct, but there are no other records of this species as occurring in Kansu or elsewhere in northern China.

Corylus heterophylla Fischer in Schtscheglof, Anz. Entdeck. Phys. Chem. & Techn. VIII. 3 (1831).—Maximowicz in Mél. Biol. XI. 317 (1881); in Bull. Acad. Sci. St. Pétersb. XXVII. 537 (1882).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 88 (Pl. David. I. 278) (1884).—Burkill in Jour. Linn. Soc. XXVI. 504 (1899).—Schneider in Sargent, Pl. Wilson. II. 450 (1916).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 354 (1922).

Corylus sp. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XXXVII. 57, no. 36726 (1916).

CHILI: near San tung ying, *F. N. Meyer*, no. 989, June 2, 1913; Weichang, *W. Purdom*, nos. 33, 92, 1909, 1910; east of Weichang, *W. Purdom*, no. 1120, 1909; Hsiao wu tai shan, *F. N. Meyer*, no. 1056, August 19, 1913; same locality, *J. Hers*, nos. 1479, 1481, 1491, July 14, 1921; Hsiao wu tai shan, Tieh ling, alt. 1300 m., *J. Hers*, no. 2129, October 7, 1922; Po hua shan, *J. Hers*, no. 1681, September 9, 1921 (sterile); Peking, western hills, alt. 700 m., *J. Hers*, no. 2221, October 11, 1922 (sterile).—See also Maximowicz, l. c., Franchet, l. c., Burkill, l. c., Schneider, l. c., Meyer, l. c., and Limpricht, l. c.

DISTRIBUTION: also Manchuria, Korea, Japan.

Corylus heterophylla var. **sutchuenensis** Franchet in Jour. de Bot. XIII. 199 (1899).—Schneider in Sargent, Pl. Wilson. II. 445 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 109 (1922); Liste Ess. Lign. Honan, 9 (1922).

Corylus heterophylla Maximowicz in Mél. Biol. XI. 317 (1881); in Bull. Acad. Sci. St. Pétersb. XXVII. 537 (1882), in part.—Burkill in Jour. Linn. Soc. XXVI. 504 (1899), pro parte.—Diels in Bot. Jahrb. XXIX. 280 (1900).

HONAN: Leng shui, Lu shih, *J. Hers*, no. 120, October 4, 1919; Yung ning, Tsi li ping, *J. Hers*, no. 453, May 22, 1919; Sung hsien, Shih tze miao, *J. Hers*, no. 600, May 26, 1919; Hwei hsien, Shansi border, *J. Hers*, no. 761, June 19, 1919.—See also Hers, l. c.

SHENSI: Kin qua san, *G. Giraldi*, July 10, 1897; Tai pei shan, *W. Purdom*, no. 998, 1910; Kwan yin tang, *F. N. Meyer*, no. 2015, September 15, 1914; Pai hsi pa, *F. N. Meyer*, no. 1938, September 18, 1914 (Herb. U. S. Dept. Agric.).—See also Burkill, l. c., Diels, l. c., Schneider, l. c.

KANSU: Dshoni River, *G. N. Potanin* (ex Burkill, l. c.); Lan tschan south of the Hoangho, *P. J. Piasezki* (ex Maximowicz, l. c. and ex Burkill, l. c.)

DISTRIBUTION: also Kiangsu (*Hers*, nos. 652, 2278), Hupeh, Szechuan, Kweichou (*Handel-Mazzetti*, no. 10331), Hunan, Kiangsi.

Burkill refers the specimen from Shensi and Kansu to the typical form, but as the Shensi specimens I have seen belong to this variety I assume that the range of typical *C. heterophylla* does not extend much beyond Chili and that in western China it is replaced by var. *sutchuenensis*.

Corylus Sieboldiana var. **mandshurica** Schneider in Sargent, Pl. Wilson. II. 454 (1916).

Corylus mandshurica Maximowicz & Ruprecht in Bull. Acad. Sci. St. Pétersb. XV. 137 (1856); in Mél. Biol. II. 431 (1857).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Burkill in Jour. Linn. Soc. XXVI. 505 (1899).

Corylus rostrata var. *mandshurica* Regel in Bull. Acad. Sci. St. Pétersb. XV. 221 (1857); in Mél. Biol. II. 488 (1857).—Hance in Jour. Linn. Soc. XIII. 87 (1872); in Jour. Bot. XIII. 137 (1875).—Maximowicz in Mél. Biol. XI. 319 (1881); in Bull. Acad. Sci. St. Pétersb. XXVII. 539 (1882).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 88 (Pl. David. I. 278) (1884).

Corylus sp. Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XXXVII. 57, no. 36727 (1916).

Corylus rostrata Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 354 (1922); non Aiton.

CHILI: Po hua shan, *J. Hers*, nos. 1399 (sterile), 1435, May 1 and July 1, 1921; Hsiao wu tai shan, alt. 1600–2700 m., *F. N. Meyer*, no. 1227, August 18, 1913; Hsiao wu tai shan, Shui shih tao, alt. 1500 m., *J. Hers*, no. 2157, October 8, 1922; without locality, *Père Chanet*, no. 66.—See also Maximowicz, l. c., Hance, l. c., Franchet, l. c., Schneider, l. c., Meyer, l. c., and Limpricht, l. c.

SHANSI: Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2011, September 7, 1922.

SHENSI: Lung chow, Li kia po, alt. 1400 m., *J. Hers*, no. 2389, July 4, 1922 (sterile).

DISTRIBUTION: also northwestern Szechuan; Manchuria, Korea, Japan. As the Shensi specimen is sterile, I am not absolutely certain if it belongs here or perhaps to the preceding species.

To one of the two preceding species belong probably also sterile specimens of *Corylus spec.* collected in Shantung on the Lau shan (see Loesener, Beih. Bot. Centralbl. XXXVII. abt. II. 107 [1919]).

Betula albo-sinensis Burkill in Jour. Linn. Soc. XXVI. 497 (1899).—Schneider in Sargent, Pl. Wilson. II. 457 (1916).

Betula Bhojpattra Bretschneider, Hist. Eur. Bot. Disc. China, 987 (1898), non Wallich.

? *Betula rosea* David Jour. Trois. Voy. Chin. I. 192 (1875), "Betulus."—Bretschneider, l. c., 850 (1898).

Betula utilis Burkill in Jour. Linn. Soc. XXVI. 409 (1899).

Betula lumanifera Hers in Jour. N. China Branch R. As. Soc. LIII. 107 (1922); Liste Ess. Lign. Honan, 5 (1922); non Winkler.

HONAN: Lu shih, Lao kium shan, *J. Hers*, no. 1188, September 21, 1919.—See also Hers, l. c.

SHANSI: Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers, no. 2042, September 7, 1922.

SHENSI: Tai pei shan, *W. Purdom*, nos. 400 (bark), 437, 995, 996, 1910.—See also Schneider, l. c.

KANSU: Tibetan country, *W. Purdom*, no. 1049, 1911; near Kagoba, *F. N. Meyer*, no. 1988, October 20, 1914 (bark; Herb. U. S. Dept. Agric.); near Pao dji, *F. N. Meyer*, November 7, 1914 (bark; Herb. U. S. Dept. Agric.).—See also Bretschneider, l. c., Burkill, l. c., and Schneider, l. c.

DISTRIBUTION: also Hupeh, Szechuan.

Betula albo-sinensis var. **septentrionalis** Schneider in Sargent, Pl. Wilson. II. 458 (1916).

? *Betula utilis* Winkler in Bot. Jahrb. XXXVI. beibl. LXXXII. 33 (1905).

KANSU: Tow River district, *W. Purdom*, no. 752, 1911.—See also Schneider, l. c.

SHENSI: Tai pa shan, *G. Giraldi* (ex Winkler, l. c. and Schneider, l. c.).

DISTRIBUTION: also Szechuan.

Betula Delavayi Franchet in Jour. de Bot. XIII. 205 (1899).—Schneider in Sargent, Pl. Wilson. II. 460 (1916).

KANSU: Min chou, Lotani, alt. 1900 m., *W. Purdom*, no. 812, 1911.—See also Schneider, l. c.

DISTRIBUTION: also Szechuan, Yunnan.

Betula chinensis Maximowicz in Bull. Soc. Nat. Moscou, LIV. pt. I, 47 (1879).—Burkill in Jour. Linn. Soc. XXVI. 498 (1899).—Schneider in Sargent, Pl. Wilson. II. 479 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 107 (1922); Liste Ess. Lign. Honan, 5 (1922).

Betula chinensis var. *angusticarpa* Winkler in Engler, Pflanzenr. IV. 61, 67, fig. 19 k–l (1904).

CHILI: Weichang, *W. Purdom*, no. 85, 1910; Tsing shui tsien, *J. Hers*, no. 1623, September 6, 1921; Po hua shan, *J. Hers*, no. 1443, July 1, 1921; Hsiao wu tai shan, *J. Hers*, no. 1494, July 14, 1921; Hsiao wu tai shan, Shui shih tao, alt. 1500 m., *J. Hers*, no. 2156, October 8, 1922; without locality, *Père Chanet*, no. 82, 1918.—See also Maximowicz, l. c., Burkill, l. c., Winkler, l. c., Schneider, l. c.

HONAN: Lu shih, Lao kiun shan, alt. 2000 m., *J. Hers*, no. 1195, September 21, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1768, September 21, 1921.—See also Hers, l. c.

DISTRIBUTION: also Manchuria, Korea.

Betula fruticosa Pallas, Reise, III. App. 758, t. Kk, fig. 1–3 (1776).—Schneider in Sargent, Pl. Wilson. II. 482 (1916).

CHILI: central and west Wei chang, *W. Purdom*, nos. 104, 8a (staminate flowers), 1910.—See also Schneider, l. c.

DISTRIBUTION: also Korea, Manchuria, Transbaikalia, Altai Mts.

Betula davurica Pallas, Reise, III. 422, note, 321, 421, Kk, fig. 4a–b (1776).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859); in Bull. Soc. Nat. Moscou, LIV. pt. 1, 47 (1879).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 92 (Pl. David. I. 282) (1884).—Burkill in Jour. Linn. Soc. XXVI. 498 (1899).—Schneider in Sargent, Pl. Wilson. II. 483 (1916).

Betula wutaica Mayr, Fremdl. Wald- u. Parkb. 450, fig. 169 (1906).

CHILI: west Weichang, *W. Purdom*, no. 109, 1910; Calceen wong, *W. Purdom*, no. 63, 1910; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, nos. 2095, 2106, October 4, 1922; Po hua shan, *J. Hers*, no. 1430, July 1, 1921 (sterile); Hsiao wu tai shan, alt. 2500–3100 m., *F. N. Meyer*, no. 1207, 1910, August 12, 1913; *J. Hers*, no. 1472, July 14, 1921; Trappist Monastery, western hills, near Peking, *N. H. Cowdry*, no. 1671, July 16, 1921.—See also Maximowicz, l. c., Franchet, l. c., Burkill, l. c., Schneider, l. c.

SHANSI: Wu tai shan, *H. Mayr* (ex Mayr, l. c.).

DISTRIBUTION: also Korea, Manchuria, Transbaikalia.

Betula japonica Siebold apud Winkler in Engler, Pflanzenr. IV.–61, 78 (1904).—Schneider in Sargent, Pl. Wilson. II. 485 (1916).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XLI, 34, no. 39489 (1917), excl. descript.

Betula alba var. *mandshurica* Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 91 (Pl. David. I. 281) (1884).—Burkill in Jour. Linn. Soc. XXVI. 496 (1899).—Vix Regel.

Betula alba var. *verrucosa* Franchet, l. c. (1884).—Burkill, l. c. 497 (1899).—Non Regel.

Betula alba var. *Tauschii* Shirai in Tokyo Bot. Mag. VIII. 319 (1894).—Burkill in Jour. Linn. Soc. XXVI. 497 (1899).

Betula japonica var. *szechuanica* Hers in Jour. N. China Branch R. As. Soc. LIII. 107 (1922); Liste Ess. Lign. Honan, 5 (1922); non Schneider.

Betula verrucosa Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib, 354 (1922); non Ehrhardt.

CHILI: Central and west Weichang, *W. Purdom*, no. 103, 1910; west Weichang, *W. Purdom*, no. 124, 1910; Weichang, *W. Purdom*, nos. 8, 937, 997, 1910; Tsing shui tsien, *J. Hers*, no. 1626, September 6, 1921; Po hua shan, *J. Hers*, nos. 1428 and 1673, July 1 and September 9, 1921; Hsiao wu tai shan, *F. N. Meyer*, no. 1163, Aug. 8, 1913; Hsiao wu tai shan, Tieh ling alt. 1300 m., *J. Hers*, nos. 2136, 2142, October 7, 1922; without locality, *W. Purdom*, no. 752, 1910.—See also Franchet, l. c., Burkill, l. c. 496, 497, Schneider, l. c., Meyer, l. c., and Limpricht, l. c.

HONAN: Tsi yuan hsien, Tien tan shan, *J. Hers*, nos. 1763 and 1791, September 21, 1921.—See also Hers, l. c.

SHANSI: Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2009, September 7, 1922.

SHENSI: Lung chow, Li kia po, alt. 1400 m., *J. Hers*, no. 2394, July 4, 1922 (sterile).

DISTRIBUTION: also Manchuria, Korea, Kurile Islands, Japan.

Alnus fruticosa Ruprecht in Beitr. Pflanzenk. Russ. Reich. II. 53 (Fl. Samojed. Cisural.) (1845).—Schneider in Sargent, Pl. Wilson. II. 503 (1916).

Alnus viridis var. *julacea* Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 91 (Pl. David. I. 281) (1884).—Burkill in Jour. Linn. Soc. XXVI. 500 (1899).—Diels in Bot. Jahrb. XXIX. 282 (1900).

SHENSI: southern Shensi, *A. David* (ex Franchet, l. c., Burkill, l. c., Diels, l. c.).

DISTRIBUTION: also Siberia, Manchuria, Korea.

There are no specimens of Alnus from northern China in the herbarium of the Arnold Arboretum and no traveler since David seems to have collected a species of Alnus, but Hance (in Jour. Bot. XIII. 137 [1875]) mentions among the plants sent to him by Bretschneider from Chili a species of Alnus whose nearest connection according to him seems to be with *A. incana*.

FAGACEAE

Castanea mollissima Blume, Mus. Bot. Lugd.-Bat. I. 286 (1850).—Rehder & Wilson in Sargent, Pl. Wilson. III. 192 (1916).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XXXVII. 47 (1916); XXXVIII. 72 (1917); XXXIX. 44, 45, 101 (1917); XLIII. 37 (1918).—Bailey, Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 6 (1922).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaiho) (1922).

Castanea vesca Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 137 (Enum. Pl. Chin. Bor. 62) (1833); non Gaertner.

Castanea vulgaris Debeaux in Act. Soc. Linn. Bordeaux, XXXI. 363 (Fl. Tchéfoû, 130) (1876); XXXIII. 64 (Fl. Tien-tsin, 41) (1879).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 254 (1884).—Non Lamarck.

Castanea sativa Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).—Skan in Jour. Linn. Soc. XXVI. 525 (1899), pro parte.—Seemen in Bot. Jahrb. XXIX. 287 (1900); XXXIV. beibl. LXXV. 28 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 107 (1919).—Non Miller.

CHILI: Peking, *C. S. Sargent*, 1903 (seeds only); near San tung ying, *F. N. Meyer*, nos. 919, 920, May 28 and 31, 1913; Ying tau ho, *F. N. Meyer*, no. 1288, September 12, 1913; without locality, *Père Chanet*, no. 76.—See also Bunge, l. c., Debeaux, l. c. (1879), Rehder & Wilson, l. c., Meyer, l. c. (1916), and Cowdry, l. c.

SHANTUNG: Tsingtau, *R. Zimmermann*, no. 352, 1901.—See also Debeaux, l. c., Franchet, l. c., Faber, l. c., Seemen, l. c. (1904); Rehder & Wilson, l. c. and Meyer, l. c., 101 (1917).

HONAN: Yung ning, Tsi li ping, *J. Hers*, nos. 421, 469, 472, May 22, 1919, no. 1356, September 13, 1919; Lu shih, Tang ho, alt. 1000 m., *J. Hers*, no. 943, October 11, 1919; Lu shih, Lao kiun shan, alt. 2000 m., *J. Hers*, no. 1154, September 21, 1919; Sinan hsien, alt. 400 m., *J. Hers*, no. 1998, September 25, 1922 (fruit only); Hwei hsien, Chung hu, *J. Hers*, no. 741, June 17, 1919.—See also Hers, l. c.

SHENSI: Tai pei shan, *W. Purdom*, no. 993, 1910; Ya tze ko, southwest of Sian fu, *F. N. Meyer*, no. 1400a, September 2, 1914; mountains near Tze wu hsien, *F. N. Meyer*, no. 2013, September 1, 1915 (Herb. U. S. Dept. Agric.).—See also Seemen, l. c., Rehder & Wilson, l. c., Meyer, l. c.

DISTRIBUTION: also Kiangsu, Chekiang, Fokien, Yunnan, Szechuan, Hupeh; Korea.

Castanea Seguinii Dode in Bull. Soc. Dendr. France, 1908, 152, fig.—Rehder & Wilson in Sargent, Pl. Wilson. III. 194 (1916).—Bailey, Gent. Herb. I. 18 (1920).

HONAN: Chi kung shan, Hupeh border, L. H. Bailey, June 13, 1917.—See also Bailey, l. c.

SHENSI: mountains near Tze wu hsien, south of Sian fu, *F. N. Meyer*, September 1, 1914.

DISTRIBUTION: also Kiangsi, Chekiang, Hupeh, Kweichow, Yunnan.

Castanopsis sclerophylla Schottky in Bot. Jahrb. XLVII. 638 (1912).—Rehder & Wilson in Sargent, Pl. Wilson. III. 201 (1916).

Quercus chinensis Abel, Narr. Jour. China, 165, t. 363 (1818).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 85 (Pl. David. I. 275) (1884).

SHENSI: Tsin ling shan, alt. 1080 m., *A. David* (ex Franchet, l. c.).

DISTRIBUTION: also Hupeh, Kiangsi, Chekiang, Fokien.

None of the later collectors seems to have seen this species on the Tsin ling shan, nor does Schottky mention it when he discusses the Oak vegetation of that mountain (in Bot. Jahrb. XLVII. 678).

Quercus dentata Thunberg, Fl. Jap. 177 (1784).—Hance in Ann. Sci. Nat. sér. 5, v. 243 (1866); in Jour. Linn. Soc. x. 488 (1869).—Forbes in Jour. Bot. XXII. 86 (1884).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 82 (Pl. David. I. 272) (1884).—Skan in Jour. Linn. Soc. XXVI. 511 (1899).—Seemen in Bot. Jahrb. XXIX. 288 (1900); XXXIV. beibl. LXXV. 28 (1904).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XII. 54, 57, 73 (1907).—Rehder & Wilson in Sargent, Pl. Wilson. III. 210 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. art II. 108 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII, 114 (1922); Liste Ess. Lign. Honan, 24 (1922).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaiho) (1922).

Quercus obovata Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 136 (Enum. Pl. Chin. Bor. 62) (1833).—Turczaninow in Bull. Soc. Nat. Moscou, X. no. VII. 157 (1837).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Carruthers in Jour. Linn. Soc. VI. 32 (1862).—

Debeaux in Act. Soc. Linn. Bordeaux XXXIII. 63 (Fl. Tien-tsin, 40) (1879).—Franchet in Mém. Sci. Soc. Nat. Cherbourg, XXIV. 254 (1884).—Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).

CHILI: Jehol, Palace grounds, *W. Purdom*, nos. 273, 274, 1910; near San tun ying, *F. N. Meyer*, no. 976, May 31, 1913; Tang shan hot springs near Peking, *F. N. Meyer*, no. 214, October, 1905; Chang li, *F. N. Meyer*, no. 194, October 11, 1905 (Herb. U. S. Dept. Agric.); Ming tombs, north of Peking, *J. G. Jack*, October 6, 1905; same locality, *F. N. Meyer*, nos. 182 (Herb. U. S. Dept. Agric.), 225, October, 1905; same locality, *J. Hers*, no. 1591, August 14, 1921.—See also Bunge, l. c., Hance, l. c., Forbes, l. c., Franchet, l. c. (Pl. David), Carruthers, l. c., Debeaux, l. c., Meyer, l. c. and Rehder & Wilson, l. c.

SHANTUNG: mountains near Chifu, *E. Faber* (no. 101; in Herb. Gray).—See also Franchet, l. c. (Mém. Cherbourg), Faber, l. c., Seemen, l. c. (1904), Forbes, l. c., Rehder & Wilson, l. c., Loesener, l. c.

HONAN: near Hodien, *F. N. Meyer*, no. 1852, July 7, 1914 (Herb. U. S. Dept. Agric.).—See also Hers, l. c.

SHENSI: Tsin ling shan, *W. Purdom*, no. 992, 1910.—See also Skan, l. c., Seemen, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan; eastern Mongolia, Korea, Japan.

Quercus mongolica Fischer apud Turczaninow in Bull. Soc. Nat. Moscou, I. 101 (1838).—Carruthers in Jour. Linn. Soc. VI. 32 (1862).—Forbes in Jour. Bot. XXII. 86 (1884).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 841 (Pl. Enum. 56) (1891); in Szechenyi, Wiss. Ergeb. Reise Ostas. II. 730 (1898).—Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).—Skan in Jour. Linn. Soc. XXVI. 518 (1899).—Seemen in Bot. Jahrb. XXXIV. beibl. LXXV. 28 (1904).—Rehder & Wilson in Sargent, Pl. Wilson. III. 230 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII abt. II. 108 (1919).

Quercus sessiliflora var. *mongolica* Franchet in Nouv. Arch. Mus. Paris, sér 2, VII. 83 (Pl. David. I. 273) (1884).

CHILI: Weichang, *W. Purdom*, nos. 42, 43, 95, 97, 999 and 991, 1910; west Weichang, *W. Purdom*, nos. 105 and 114, 1910; Tsing shui tsien, *J. Hers*, no. 1635, September 6, 1921; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, nos. 2089, 2094, 2099, October 4, 1922; Hsiao wu tai shan, Tieh ling, alt. 1300 m., *J. Hers*, no. 2124, October 7, 1922; Po hua shan, *J. Hers*, no. 1404, May 1, 1921 (flowering branch); without locality, *Père Chanet*, no. 79, 1919.—See also Carruthers, l. c., Forbes, l. c., Franchet, l. c., Skan, l. c., Rehder & Wilson, l. c.

SHANTUNG: see Faber, l. c., Forbes, l. c., Skan, l. c., Seemen, l. c. and Loesener, l. c.

SHANSI: near Mo chia chuang, *F. N. Meyer*, no. 1702, July 11, 1914 (Herb. U. S. Dept. Agric.); Wu chai hsien, Ta nan kow, *Tchuang Kieh*, Hers, no. 2015, September 7, 1922.

SHENSI: south of Yenan fu, *W. Purdom*, no. 333, 1910; northwest of Yenan fu, *W. Purdom*, nos. 333a, 333b, 1910; Lung chow, Kuan shan, alt. 2000 m., *J. Hers*, no. 2342, July 3, 1922.

KANSU: see Kanitz, l. c.

DISTRIBUTION: also Kiangsu; Manchuria, Saghalin, Korea, Japan.

Quercus liaotungensis Koidzumi in Tokyo Bot. Mag. XXVI. 166 (1912).—Rehder & Wilson in Sargent, Pl. Wilson. III. 233 (1916).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XXXIX. 101, no. 38181 (1917).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).

CHILI: Hsiao wu tai shan, alt. 2000 m., *F. N. Meyer*, no. 1211, August 13, 1913; same locality, *J. Hers*, no. 1501, July 14, 1921.—See also Rehder & Wilson, l. c. and Meyer, l. c.

HONAN: Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1769, September 21, 1921; Hwei hsien, Shang lieh kiang, *J. Hers*, no. 724, June 17, 1919.—See also Hers, l. c.

DISTRIBUTION: also Manchuria (Liaotung Peninsula).

Quercus aliena Blume, Mus. Bot. Lugd.-Bat. I. 298 (1850).—Hance in Jour. Bot. XIII. 361 (1875).—Forbes in Jour. Bot. XXII. 85 (1884).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 841 (Pl. Enum. 56) (1891); in Szechenyi, Wiss. Ergeb. Reise Ostas. II. 730 (1898).—Skan, Jour. Linn. Soc. XXVI. 505 (1899).—Seemen in Bot. Jahrb. XXIX. 288 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. III. 214 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).

CHILI: Pau shan, *N. H. Cowdry*, no. 1302, May 16, 1921.—See also Hance, l. c. and Forbes, l. c.

HONAN: Yung ning, Chuan pao shan, alt. 1500 m., *J. Hers*, no. 1119, October 17, 1919.—See also Hers, l. c.

SHENSI: *G. Giraldi* (ex Skan, l. c. and Seemen, l. c.).

KANSU: see Kanitz, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Chekiang; Korea, Japan.

The only typical specimens of *Quercus aliena* I have seen from northern China are Hers' no. 1119 from Honan and Cowdry's no. 1302 from Chili. The other references cited above probably belong to the following varieties or forms; those from Chili and from Shensi may be *Q. aliena pellucida* or *Q. aliena calvescens*. From Kansu I have seen no specimens.

Quercus aliena var. **pubipes** Rehder in Jour. Arnold Arb. I. 136 (1919).—Bailey, Gent. Herb. I. 18 (1920).

HONAN: Chi kung shan, alt. 500–800 m., *L. H. Bailey*, June 13, 1917; near Ho dien, *F. N. Meyer*, no. 1853, July 7, 1914 (Herb. U. S. Dept. Agric.) Yung ning, Tsi li ping, *J. Hers*, no. 470, May 22, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, nos. 1699, 1708, September 16 and 23, 1921.

The specimens from the Tien tan shan and from Yung ning have the petioles less pubescent than the type or even glabrous but the pubescence of the under side of the leaves and their obovate shape is the same, though they are larger, measuring up to 15 cm. in length and to 11.5 cm. in width. This variety has not yet been found outside of Honan.

Quercus aliena var. **pellucida** Blume, Mus. Bot. Ludg.-Bat. I. 298 (1850).—Rehder in Jour. Arnold Arb. I. 136 (1919).—Bailey, Gent. Herb. I. 18 (1920).

Q. aliena var. *pekingensis* Schottky in Bot. Jahrb. XLVII. 636 (1912).

CHILI: mountains west of Peking, *E. Bretschneider* and *C. E. Skatschkoff* (ex Schottky, l. c.).

HONAN: Chi kung shan, *L. H. Bailey*, June 13, 1917; Kio shan, *L. H. Bailey*, June 24, 1917 (two specimens differing in the shape of the leaves); Teng feng, Yu tai shan, *J. Hers*, no. 299, June 17, 1919.

SHENSI: Han cheng hsien, Moutan shan, *W. Purdom*, no. 379, 1910.

DISTRIBUTION: also Japan.

This variety differs from the type in the glabrous or nearly glabrous under side of the leaves. I do not see how Schottky's var. *pekingensis* can be distinguished from Blume's variety by the description given by the authors; I have seen no specimen of *Q. aliena* from the neighborhood of Peking except *Q. aliena* f. *calvescens* but none with "foliis . . . glaberrimis."

Quercus aliena var. **acuteserrata** Maxim. f. **calvescens** Rehder & Wilson in Sargent, Pl. Wilson. III. 215 (1916).

Quercus aliena var. *acuteserrata* Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922); non Maximowicz sensu stricto.

CHILI: near San tung ying, *F. N. Meyer*, No. 955, May 29, 1913.

HONAN: Lu shih, Lao kiun shan, alt. 2000 m., *J. Hers*, No. 1197; Lu shih, Hiung eul shan, alt. 1400 m., *J. Hers*, No. 929, October 10, 1919; without precise locality, *J. Hers*, No. 183, 1919.

SHENSI: Lao y san, *G. Giraldi*, 1897; south of Sian fu, near Nan to chu, *F. N. Meyer*, no. 1693, January 21, 1916 (Herb. U. S. Dept. Agric.).

DISTRIBUTION: also Hupeh; Korea, Manchuria.

Quercus Fabri Hance in Jour. Linn. Soc. X. 202 (1869).—Rehder & Wilson in Sargent, Pl. Wilson. III. 216 (1916).—Bailey, Gent. Herb. I. 18 (1920).

HONAN: Chi kung shan, near base of mountains, *L. H. Bailey*, June, 1917 (ex Bailey, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Kiangsu, Chekiang, Kwangtung.

Quercus glandulifera Blume, Mus. Bot. Lugd.-Bat. I. 295 (1850).—Skan in Jour. Linn. Soc. XXVI. 514 (1899).—Rehder & Wilson in Sargent, Pl. Wilson. III. 212 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II.

108 (1919).—Bailey, Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).

SHANTUNG: Lau shan, *F. N. Meyer*, no. 321, August, 1907.—See also Skan, l. c., Rehder & Wilson, l. c., Loesener, l. c.

HONAN: Fu niu shan, *J. Hers*, no. 172, October 6, 1918; Lu shih, Lao kiun shan, *J. Hers*, no. 1196, September 21, 1919; Tsi yan hsien, Tien tan shan, *J. Hers*, no. 1892, September 21, 1921; without precise locality, *J. Hers*, no. 183b.—See also Hers, l. c.

DISTRIBUTION: also Kiangsu, Hupeh, Kiangsi, Szechuan, Hunan (*Handel-Mazzetti*, nos. 11614, 11929), Kweichou; Korea, Japan.

Quercus serrata Thunberg, Fl. Jap. 176 (1784).—Hance in Jour. Linn. Soc. XIII. 8 (1873).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 254 (1884).—Debeaux in Act. Soc. Linn. Bordeaux, XXXI. 362 (Fl. Tchéfoû, 128) (1876).—Forbes in Jour. Bot. XXII. 86 (1884).—Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).—Skan in Jour. Linn. Soc. XXVI. 520 (1899).—Seemen in Bot. Jahrb. XXXIV. beibl. LXXV. 28 (1904).—Rehder & Wilson in Sargent, Pl. Wilson. III. 217 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 108 (1919).—Bailey, Gent. Herb. I. 18 (1920).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaiho) (1922).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).

CHILI: near San tung ying, *F. N. Meyer*, no. 977, May 31, 1913; near Chang li, *F. N. Meyer*, no. 197, October, 1905; Peking, cemetery, *J. G. Jack*, October 10, 1905.—See also Rehder & Wilson, l. c., Cowdry, l. c.

SHANTUNG: Chifu, *C. S. Sargent*, September 22, 1903.—See also Hance, l. c., Debeaux, l. c., Franchet, l. c., Faber, l. c., Forbes, l. c., Skan. l. c., Seemen, l. c., Rehder & Wilson, l. c., and Loesener, l. c.

HONAN: Lao kiun shan, alt. 900 m., *J. Hers*, no. 1234, September 23, 1919.—See also Bailey, l. c. and Hers, l. c.

SHENSI: mountains near Nan to chu, south of Sian fu, *F. N. Meyer*, no. 1691, January 21, 1914 (Herb. U. S. Dept. Agric.)

KANSU: near Yan pu ko, *F. N. Meyer*, no. 1968, October 6, 1914.

DISTRIBUTION: also Kiangsi, Chekiang, Hupeh, Szechuan, Hunan; Korea, Japan, Himalayas.

Quercus variabilis Blume, Mus. Bot. Lugd.-Bat. I. 297 (1850).—Rehder & Wilson in Sargent, Pl. Wilson. III. 219 (1916).—Bailey, Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).

Quercus chinensis Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 135 (Enum. Pl. Chin. Bor. 61) (1833).—Turczaninow in Bull. Soc. Nat. Moscou, X. no. VII. 157 (1837).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Non Abel.

Quercus Bungeana Forbes in Jour. Bot. XXII. 83 (1884).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 254 (1884); in Nouv. Arch. Mus. Paris, sér. 2, VII. 85 (Pl. David. I. 275) (1884).—Skan in Jour. Linn. Soc. XXVI.

508 (1899).—Seemen in Bot. Jahrb. XXIX. 291 (1900).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 108 (1919).

CHILI: Chang li, *F. N. Meyer*, no. 326, November, 1905; Peking, western hills, *W. Purdom*, April 30, 1912; same locality, *J. Hers*, no. 1609, August 21, 1921; Po hua shan, *J. Hers*, no. 1382, May 1, 1921.—See also Bunge, l. c., Forbes, l. c., Franchet, l. c. (Pl. David.), Skan. l. c.

SHANTUNG: Lau shan, *F. N. Meyer*, no. 307, August, 1907.—See also Forbes, l. c., Franchet, l. c. (Mém. Cherbourg), and Loesener, l. c.

HONAN: Tsi yuan hsien, Tien tan shan, *J. Hers*, nos. 1727, 1757, September 21, 1921; Teng feng, Yu tai shan, *J. Hers*, no. 303, June 17, 1919; Sung hsien, San kuan miao, alt. 1000 m., *J. Hers*, no. 1317, September 27, 1919; Hwei hsien, Pai yun sze, *J. Hers*, no. 794, June 15, 1919; Hwei hsien, Ta fu sze, *J. Hers*, no. 780, June 16, 1919; Kio shan, *L. H. Bailey*, June 22, 1917, June 24, 1917 (form with oblong, obtuse leaves).—See also Bailey, l. c., and Hers, l. c.

SHANSI: Hia hsien, Huang lai kow, *J. Hers*, no. 1835, October 3, 1921.

SHENSI: Tai pei shan, *W. Purdom*, no. 989, 1910; Moutan shan, southwest of Han chieng hsien, *W. Purdom*, no. 380, 1910; Kwan yin tang, *F. N. Meyer*, no. 1912, September 15, 1914.—See also Skan, l. c., Seemen, l. c.

KANSU: near Yu yin chen, *F. N. Meyer*, no. 1679, September 25, 1914.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan; Korea, Japan.

Quercus spinosa David apud Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 84 (Pl. David. I. 274) (1884).—Rehder & Wilson in Sargent, Pl. Wilson. III. 224 (1916).

Quercus ilicioides David, Jour. Trois. Voy. Chin. I. 148 (1875); nomen semi-nudum.—Bretschneider, Hist. Eur. Bot. Disc. China, 850 (1898).

Quercus Ilex var. *spinosa* Franchet in Jour. de Bot. XIII. 152 (1899).—Skan in Jour. Linn. Soc. XXVI. 516 (1899).—Seemen in Bot. Jahrb. XXIX. 290 (1900).

SHENSI: Tai pei shan, southern slope, *W. Purdom*, no. 988, 1910.—See also Franchet, l. c., Skan, l. c., Seemen, l. c.

KANSU: Chi shan, near Chen hsien, *F. N. Meyer*, nos. 1764, 1765, October 1, 1914.—See also Skan, l. c.

DISTRIBUTION: also Hupeh, Yunnan.

Quercus acrodonta Seemen in Bot. Jahrb. XXIII. beibl. LVII. 48 (1897); XXIX. 290 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. III. 225 (1916).

Quercus Ilex var. *acrodonta* Skan in Jour. Linn. Soc. XXVI. 516 (1899).

Quercus phillyreoides Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 85 (Pl. David. I. 275) (1884); non Gray.

SHENSI: Tsin ling shan, *A. David* (ex Franchet, l. c.); "Mt. Lunsan huo," *G. Giraldi* (ex Skan, l. c., Seemen, l. c. [1900]).

DISTRIBUTION: also Hupeh.

Quercus spathulata Seemen in Bot. Jahrb. XXIII. beibl. LVII. 49 (1897).—Rehder & Wilson in Sargent, Pl. Wilson. III. 226 (1916).—Hers in Jour.

N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).

HONAN: Sung hsien, Shi tze miao, alt. 1200 m., *J. Hers*, no. 584, May 26, 1919.—See also Hers, l. c.

SHENSI: Niu pei shan, alt. 700 m., *J. Hers*, no. 2452, October 11, 1922.

KANSU: Kagoba, alt. 2500 m., *F. N. Meyer*, no. 1990, October 30, 1914.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan (Forrest, nos. 10098, 10572, 10600, 11414).

Quercus Baronii Skan in Jour. Linn. Soc. XXVI. 507 (1899).—Seemen in Bot. Jahrb. XXIX. 291 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. III. 226 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 24 (1922).

HONAN: Kwang yin tang, alt. 600 m., *J. Hers*, no. 32, May 10, 1919; Mi tow sze, *J. Hers*, no. 33, August 15, 1918; Teng feng, Yu tai shan, alt. 800 m., *J. Hers*, no. 249, April 23, 1919; Sung hsien, Shih tze miao, *J. Hers*, no. 566, May 26, 1919; Yung ning, Tsi li ping, *J. Hers*, no. 463, May 22, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, nos. 1756, 1759, September 21, 1921.—See also Hers, l. c.

SHANSI: Hia hsien, Huang lai kow, *J. Hers*, no. 1834. October 2, 1921; without precise locality, *J. Hers*, no. 2000, September, 1922.

SHENSI: "Kin qua san," *G. Giraldi*, July 10, 1897; "Lao y san," *G. Giraldi*, 1897; near Sze wu hsien, south of Sian fu, *F. N. Meyer*, no. 1890, September 1, 1914; near Nan to tchu, south of Sian fu, *F. N. Meyer*, no. 1692, January 21, 1914; Cheng shih tan, alt. about 900 m., *J. Hers*, no. 2436, October 8, 1922.—See also Skan, l. c., Seemen, l. c., Rehder & Wilson, l. c.

KANSU: Near Yan pu ko, *F. N. Meyer*, no. 1973, October 6, 1914.

DISTRIBUTION: also Hupeh, Szechuan.

Quercus myrsinaefolia Blume, Mus. Bot. Lugd.-Bat. I. 305 (1850).—Rehder & Wilson in Sargent, Pl. Wilson. III. 236 (1916).—Bailey, Gent. Herb. I. 18 (1920).

HONAN: Chi kung shan, alt. 500–800 m., *L. H. Bailey*, June 30, 1917.—See also Bailey, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan, Hunan (*Handel-Mazzetti*, no. 11791), Hongkong; Japan.

ULMACEAE

Ulmus macrocarpa Hance in Jour. Bot. VI. 332 (1868).—Planchon in De Candolle, Prodr. XVII. 162 (1873).—Maximowicz in Bull. Acad. Sci. St. Pétersb. XVIII. 289 (1873); in Mél. Biol. IX. 22 (1873).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 78, t. 8, fig. C. (Pl. David. I. 268) (1884).—Hemsley in Jour. Linn. Soc. Bot. XXVI. 447 (1894).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XIV. 48, no. 22364 (1909).—Schneider in Sargent, Pl. Wilson. III. 251 (1916) —Hers in Jour.

N. China Branch R. As. Soc. LIII. 117 (1922); Liste Ess. Lign. Honan, 32 (1922).

Ulmus sp. novae 2 Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).

Ulmus spec. Meyer in Bull. U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XV. 24, nos. 22678, 22682 (1909).

Ulmus Davidiana Schneider in Sargent, Pl. Wilson. III. 261 (1916), quoad specimina e Chili; non Planchon.

CHILI: Weichang, *W. Purdom*, no. 262, 1910; Kalgan, *N. H. Cowdry*, nos. 1378 and 1583, June 2 and 27, 1921; Trappist Monastery, western hills near Peking, *N. H. Cowdry*, no. 1679, July 16, 1921; Nankow Pass, *F. N. Meyer*, no. 208, November, 1905; Nankow, rocky cliffs, *F. N. Meyer*, no. 1034, July 27, 1913; near Shih wen in rocky crevices and in loess cliffs, *F. N. Meyer*, no. 1088, August 3, 1913; Ming tombs, *J. Hers*, no. 1592, August 14, 1921; western hills near Peking, *J. Hers*, nos. 1587, 2228, August 7, 1921 and October 11, 1922; Po hua shan, *J. Hers*, no. 1669, September 9, 1921; Hsiao wu tai shan, *J. Hers*, nos. 1492, 2196bis, July 14, 1921 and October 9, 1922; Huai lai hsien, Liu shu chwang, alt. 800 m., *J. Hers*, no. 2078, October 3, 1922; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, no. 2107, October 4, 1922; Ta hung men, alt. 700 m., *J. Hers*, no. 2215, October 10, 1922; Ta miao, alt. 900 m., *J. Hers*, no. 2212, October 10, 1922.—See also Maximowicz, l. c., Hance, l. c., Planchon, l. c., Franchet, l. c., Hemsley, l. c., Meyer, l. c. XIV. 48 (1909).

HONAN: Kung hsien, *J. Hers*, nos. 34, 87, May 10, 1919 and April 7, 1920 (fruit); Hwei hsien, Ta fu sze, *J. Hers*, no. 783, June 16, 1919.—See also Hers, l. c.

SHANSI: Yento, *F. N. Meyer* (ex Schneider, l. c.); Hia hsien, Low shan, *J. Hers*, no. 1877, October 3, 1921; Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers nos. 2046, 2049, Sept. 7, 1922.—See also Meyer, l. c., XV. 24 (1909).

SHENSI: Yenan fu district, *W. Purdom*, nos. 349, 356 (fruits), 1911.

DISTRIBUTION: also Manchuria, northern Korea.

Ulmus Bergmanniana Schneider, Ill. Handb. Laubholzk. II. 902, fig. 565 a–b (1912); in Sargent, Pl. Wilson. III. 240 (1916).

HONAN: without precise locality, *J. Hers*, No. 6, 1918.

KANSU: Chi shan, near Cheng hsien, *F. N. Meyer*, No. 1638, October 1, 1914.

DISTRIBUTION: also Hupeh, Szechuan.

Meyer's specimen from Kansu, which is like the Honan specimen unfortunately sterile, differs from typical *U. Bergmanniana* in its broader distinctly elliptic leaves which measure 8–10 cm. in length and 4.5–6 cm. in width, but in all other characters it agrees with typical Hupeh specimens.

Ulmus laciniata Mayr, Fremdl. Wald- u. Parkb. 523, fig. 243 (1906).—Schneider in Sargent, Pl. Wilson. III. 255 (1916).

CHILI: Weichang, *W. Purdom*, no. 87, 1910; Hsiao wu tai shan, *J. Hers*, nos. 1528, 1566, July 14 and 16, 1921 (sterile); same locality, *F. N. Meyer*, no. 1328, August 23, 1913.—See also Schneider, l. c.

DISTRIBUTION: also Manchuria, Korea, Japan.

Ulmus Wilsoniana Schneider, Ill. Handb. Laubholzk. II. 904, figs. 565e, 566c-d (1912); in Sargent, Pl. Wilson. III. 238 (1916).—Bailey, Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 117 (1922); Liste Ess. Lign. Honan, 32 (1922).

HONAN: Mien chih, alt. 800 m., *J. Hers*, no. 57, August 20, 1919; Teng feng hsien, Yu tai shan, alt. about 800 m., *J. Hers*, no. 232, April 23, 1919; Yung ning, Tsi li ping, *J. Hers*, no. 468, May 22, 1919; Yung ning, Chuan pao shan, *J. Hers*, no. 1110, October 17, 1919.—See also Bailey, l. c. and Hers, l. c.

DISTRIBUTION: also Hupeh.

The first three specimens which are all sterile agree well with typical material from Hupeh, but no. 1110 from the Chuan pao shan represented by slender shoots with rather small glabrescent leaves is doubtful, but may belong to var. *psilophylla* Schneider.

Ulmus japonica Sargent, in Trees & Shrubs, II. 1, t. 101 (1907).—Schneider in Sargent, Pl. Wilson. III. 258 (1916).—Komarov in Bull. Jard. Bot. Pierre le Grand, XVI. 175 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 116 (1922); Liste Ess. Lign. Honan, 32 (1922).

Ulmus campestris a. *vulgaris* Maximowicz in Bull. Acad. Sci. St. Pétersb. XVIII. 290 (1873); in Mél. Biol. IX. 22 (1873); non Spach.

Ulmus campestris f. *suberosa* Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 78 (Pl. David. I. 268) (1884); non Wahlenberg.

Ulmus campestris Hemsley in Jour. Linn. Soc. XXVI. 446 (1894), pro parte.—Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).—Seemen & Loesener in Bot. Jahrb. XXXIV. beibl. LXXV. 29 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. art. II. 109 (1919).—Non Linnaeus.

CHILI: Hsiao wu tai shan, *F. N. Meyer*, no. 1328, August 23, 1913; same locality, *J. Hers*, no. 1518, July 14, 1921; Hsiao wu tai shan, Shui shih tao, alt. 1500 m., *J. Hers*, no. 2159, October 8, 1922; Huai lai hsien, Yang kia ping, alt. 900 m., *J. Hers*, no. 2108, October 4, 1922; Po hua shan, *J. Hers*, nos. 1382, 1455, 1682, May 1, July 1 and September 9, 1921; Shi feng ko, *F. N. Meyer*, no. 993, June 2, 1913.—See also Maximowicz, l. c., Franchet, l. c., Hemsley, l. c. and Schneider, l. c.

SHANTUNG: See Faber, l. c., Seemen & Loesener, l. c., Schneider, l. c. and Loesener, l. c.

HONAN: Sung hsien, Shih tze miao, *J. Hers*, no. 492, May 26, 1919; Sung hsien, San kuan miao, alt. about 1200 m., *J. Hers*, no. 537, May 24, 1919; Hwei hsien, Shang lieh kiang, *J. Hers*, no. 728, June 17, 1919.—See also Hers, l. c.

SHANSI: Hu po po, southeastern Shansi, *F. N. Meyer*, no. 1632, July 10, 1914 (Herb. U. S. Dept. Agric.).

SHENSI: Pai shi pu, *F. N. Meyer*, no. 1636, September 18, 1914 (Herb. U. S. Dept. Agric.); Lung chow, Li kia po, alt. 1800 m., *J. Hers*, no. 2368, July 4, 1922.

KANSU: near Ping lo, *F. N. Meyer*, no. 1644, October 7, 1914 (Herb. U. S. Dept. Agric.).

DISTRIBUTION: also Manchuria, Korea, Japan.

The specimens enumerated above are unfortunately all sterile, but agree with typical *U. japonica* from Japan, except Hers' nos. 1455 and 1682 which have nearly glabrous branchlets and leaves and look more like *U. foliacea* Gilib.

Komarov in his Annotations to the flora of southern Ussuri (in Bull. Jard. Bot. Pierre le Grand, XVI. 164 [1916]) distinguishes the following varieties of *U. japonica*: α. *laevis*, β. *scabra*, γ. *puberula* and δ. *saxatilis*. These probably occur, at least partly, also in northern China, but with the incomplete material at hand and without having seen any of Komarov's material it does not seem advisable to try to identify the Chinese material with Komarov's varieties.

Ulmus Davidiana Planchon in Compt. Rend. Acad. Sci. Paris, LXXIV pt. 1, 1498 (1872), nomen; in De Candolle, Prodr. XVII. 158 (1873).—Schneider in Sargent, Pl. Wilson. III. 261 (1916), in part.—Hers in Jour. N. China Branch R. As. Soc. LIII. 116 (1922); Liste Ess. Lign. Honan, 32 (1922).

CHILI: Jehol, *A. David*, no. 1716 (ex Planchon, l. c.).

DISTRIBUTION: also Kiangsu (*J. Hers*, no. 664).

Of this species I have seen a young leaf and a fruit of the type kindly sent to the Arboretum by Professor H. Lecomte of the Natural History Museum in Paris. The other specimens referred by Schneider (l. c.) to this species I am unable to separate from *U. macrocarpa* Hance, from which sterile specimens of *U. Davidiana* may be distinguished by the absence of the corky wings, by the smaller and narrower leaves slightly pubescent above when young and soon glabrous, pubescent beneath, by the densely pubescent petioles and by the winter-buds covered with grayish silky pubescence; in *U. macrocarpa* the branches usually develop two broad corky wings, the leaves are much broader and larger, usually rhombic-obovate, very scabrid above, and glabrescent beneath, the petioles are only slightly pubescent and the winter-buds are dark chestnut-brown or nearly black and only slightly villose.

A specimen with young fruit collected in northern Kiangsu, on the Liu lin shan, near Haichow (*J. Hers*, no. 664) apparently belongs here; in the pubescence of the samara and the leaves it agrees with the type but the leaves are more cuneate at base and the samara is nearly rounded and abruptly contracted at the base; the hirsute pubescence of the branchlets persists until the second year.

The inclusion of *U. Davidiana* by Hers in his list of Honan plants is probably an error and based on his no. 664 from Kiangsu.

Ulmus pumila Linnaeus, Spec. 226 (1753).—Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 135 (Enum. Pl. China Bor. 61) (1833).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 78 (Pl. David. I. 268) (1884).—Schneider in Sargent, Pl. Wilson. III. 242 (1916).—Bailey Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 117 (1922); Liste Ess. Lign. Honan, 32 (1922).

Ulmus campestris δ. *pumila* Maximowicz in Bull. Acad. Sci. St. Pétersb. XVIII. 290 (1873); in Mél. Biol. IX. 23 (1873).—Pritzel in Bot. Jahrb. XXIX. 296 (1900).

Ulmus campestris Hemsley in Jour. Linn. Soc. XXVI. 446 (1894), pro parte; non Linnaeus.

CHILI: Weichang, *W. Purdom*, no. 96, 1910; Nankow, *J. G. Jack*, October 6, 1905; Shi wen, *F. N. Meyer*, no. 1069, August 2, 1913; Calceen wong, *W. Purdom*, no. 61, 1910; Hsiao wu tai shan, *F. N. Meyer*, no. 1385, August 30, 1913; Peking, Temple of Agriculture, *C. S. Sargent*, September 15, 1905; near Peking, *J. G. Jack*, October 7 and 9, 1905; Peking, Temple of Heaven, *E. H. Wilson*, April 14, 1909; Peking, *F. N. Meyer*, no. 1403, April 30, 1913; Peking, city wall, *F. N. Meyer*, no. 206, September, 1905, no. 923, April 18, 1913, no. 928, May 20, 1913 (var. foliis variegatis); Peking plain, *W. Purdom*, no. 1048, 1910; Wo fu ssu, *N. H. Cowdry*, no. 1014, September 26, 1920.—See also Bunge, l. c., Franchet, l. c., Maximowicz, l. c., and Schneider, l. c.

SHANTUNG: Chifu, *C. S. Sargent*, September 27, 1905.—See also Schneider, l. c.

HONAN: "the common Elm of the Honan plain," *J. Hers*, 1919.—See also Hers, l. c.

SHANSI: near Tsin tse, *F. N. Meyer*, no. 416, May, 1907 (sterile; Herb. U. S. Dept. Agric.); Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2043, September 7, 1922.

SHENSI: Yenan fu district, south, *W. Purdom*, no. 357, 1910; Tai pei shan, *W. Purdom*, nos. 417 and 984, 1910.—See also Pritzel, l. c.

DISTRIBUTION: also Kiangsi, Szechuan, Yunnan; Transbaikalia, Manchuria, Korea.

The specimens exhibit a wide variation in the size and shape of the leaves; some of the vigorous shoots of Hers' specimens from Honan have oblong-lanceolate leaves up to 10 cm. long, while Purdom's specimens from Tai pei shan have rhombic-elliptic leaves 2–3.5 cm. long and pilose on the midrib and partly on the veins beneath and the branchlets are thinly appressed-pubescent as in Meyer's nos. 928, 1069 and 1385 from Peking. In Meyer's no. 416 from Shansi doubtfully referred to this species, the branchlets and petioles are short-villose and the young leaves are slightly pubescent on both sides. Piasezki's specimens cited "ex Maximowicz" from Shensi and Kansu by Hemsley (l. c.) may belong here, but there is no other evidence that *U. pumila* occurs in Kansu.

Ulmus pumila f. **pendula** Rehder in Bailey Cycl. Am. Hort. IV. 1882 (1902), pro var.—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XLIII. 37, pl. 2 (1918), pro var.

CHILI: near Peking and Feng tai (ex Meyer, l. c.).

Meyer's photograph reproduced on pl. 2 (l. c.) shows a large tree growing on an old grave near Feng tai in its winter state with nearly horizontally spreading tortuous branches and pendulous branchlets.

Ulmus glaucescens Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 76, t. 8, fig. a (Pl. David. I. 267) (1884).—Schneider in Sargent, Pl. Wilson, III. 263 (1916).

This species is not known to me from China proper; it was collected by David (no. 2634 ex Franchet, l. c.) near "Sartchy" or Sarchi about 20 miles west of the border of northern Shansi, but not in Shansi itself as stated by Schneider (l. c.).

Ulmus parvifolia Jacquin, Pl. Rar. Hort. Schoenbr. III. 6, t. 262 (1798).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 253 (1884).—Pritzel in Bot. Jahrb. XXIX. 296 (1900).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XIV. 49, no. 22375 (1909); XXXIX, 47 (1917).—Schneider in Sargent, Pl. Wilson. III. 244 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 108 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII. 117 (1922); Liste Ess. Lign. Honan, 32 (1922).

CHILI: Temple of Heaven grounds, *F. N. Meyer*, no. 187, September, 1905.—See also Meyer, l. c. (1909).

? SHANTUNG: Chifu, *A. A. Fauvel* (ex Franchet, l. c.).

HONAN: without precise locality, *J. Hers*, no. 2, 1918.—See also Hers, l. c.

SHENSI: In kia po, *G. Giraldi*, October, 1897; Tze wen hsien, *F. N. Meyer*, no. 1634, September 1, 1914; Lan yu ko, *F. N. Meyer*, no. 1635, September 5, 1914.—See also Pritzel, l. c. and Meyer, l. c. (1917).

DISTRIBUTION: also Kiangsu (*J. Hers*, nos. 620, 1029), Hupeh, Hunan, Kwangtung; Korea, Japan.

This species does not seem to occur spontaneously in Chili; Meyer's nos. 1069 and 1385 from Shi wen and the Hsiao wu tai shan cited by Schneider (l. c.) under *U. parvifolia* belong to *U. pumila* L. and represent the form with appressed-pubescent branchlets. Its occurrence in Shantung is also doubtful; Fauvel's specimen from Chifu is more likely to be *U. pumila*, of which specimens from Chifu are in this herbarium.

Celtis koraiensis Nakai in Jour. Coll. Sci. Tokyo XXXI. 191, pl. 18 (Fl. Kor. II) (1911); in Tokyo Bot. Mag. XXVIII. (265), figs. 2aa, cc (1914).—Yabe, Enum. Pl. Manch. 37, t. 2, fig. 4 (1912).—Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 7 (1922).

? *Celtis spec.* Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 109 (1909).

CHILI: Po hua shan, *J. Hers*, no. 1394[a], May 1, 1921.

SHANTUNG: Lau shan and Cape Yatau (ex Loesener, l. c.).

HONAN: Teng feng, Yu tai shan, *J. Hers*, no. 207[bis], April 23, 1919; Lu shih, Tang ho, alt. 1000 m., *J. Hers*, no. 961, October 11, 1919; Sung hsien, Shih tze miao, alt. 1200 m., *J. Hers*, no. 1292, September 25, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1734, September 21, 1921; Yung ning, Tsi li ping, *J. Hers*, nos. 439, 1373, May 22 and September 30, 1919; Yung ning, Yo tze ping, alt. 1000 m., *J. Hers*, no. 823, October 4, 1919; Hwei hsien, Shang lieh kiang, *J. Hers*, no. 726, June 17, 1919; Hwei hsien, Ta fu sze, *J. Hers*, no. 753, June 16, 1919; without locality, *J. Hers*, no. 1992.—See also Hers, l. c.

SHANSI: Hia hsien, Huang lai kow, *J. Hers*, no. 1847, October 2, 1921.

SHENSI: Lung chow, Kuan shan, alt. 2000 m., *J. Hers*, no. 2339, July 3, 1922.

DISTRIBUTION: also Kiangsu (*J. Hers*, nos. 1011, 1071); southern Manchuria, Korea.

This is a remarkable species easily recognized by its large peculiarly shaped leaves which are furnished at the truncate apex with an elongated lanceolate or linear-lanceolate middle lobe and with usually several lateral elongated teeth; the leaves are usually 8–12 cm. long, but on coppice shoots may attain 17 cm. in length and as much in width; the dull orange-yellow slender-stalked fruits are about 1 cm. high. According to Loesener's description his *Celtis spec.* from Shantung is apparently *C. koraiensis*.

Celtis labilis Schneider in Sargent, Pl. Wilson. III. 267 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 7 (1922).

CHILI: Hsiao wu tai shan, *J. Hers*, no. 1495, July 14, 1921.

HONAN: Yung ning, Tsi li ping, alt. about 1100 m., *J. Hers*, no. 411 bis, May 22, 1919; Sung hsien, San kuan miao, alt. about 1200 m., *J. Hers*, no. 512, May 24, 1919; Hwei hsien, Ta fu sze, *J. Hers*, no. 781, June 16, 1919.—See also Hers, l. c.

KANSU: Tsing chow, Kuan tze chen, alt. 1600 m., *J. Hers*, no. 2414, July 22, 1922 (sterile).

DISTRIBUTION: also Kiangsu (*J. Hers*, no. 672), Hupeh.

The specimens enumerated above are all sterile, but they agree in shape and pubescence of the leaves with specimens from Hupeh, though the leaves are generally smaller.

Celtis Bungeana Blume, Mus. Bot. Lugd.-Bat. II. 71 (1852).—Planchon in De Candolle, Prodr. XVII. 171 (1873).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 253 (1884); in Nouv. Arch. Mus. Paris, sér. 2, VII. 79 (Pl. David. I. 269) (1884).—Hemsley in Jour. Linn. Soc. XXVI. 449 (1894), pro parte.—Faber in Denkschr. Entwickel. Kiautschou, 29 (1898).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 33 (1905).—Meyer in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. XIV. 29, no.

21972 (1909).—Schneider in Sargent, Pl. Wilson. III. 269 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII, abt. II. 109 (1919).—Bailey, Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 7 (1922).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaiho) (1922).

Celtis chinensis Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 135 (Enum. Pl. Chin. Bor. 61) (1833).—Turczaninow in Bull. Soc. Nat. Moscou, X. no. VII. 157 (1837).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Non *C. sinensis* Pers.

Celtis sinensis Planchon in Ann. Sci. Nat. sér. 3, X. 286 (1848).—Maximowicz in Bull. Acad. Sci. St. Pétersb. XVIII. 293; in Mél. Biol. IX. 27 (1873), quoad specimina e China bor.—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 33 (1905).—Non Persoon.

Celtis Davidiana Carrière in Rev. Hort. 1868, 300.—Planchon in De Candolle Prodr. XVII. 172 (1873).—Hemsley in Jour. Linn. Soc. XXVI. 450 (1894).

Celtis Biondii Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 7 (1922); non Pampanini.

CHILI: Weichang, *W. Purdom*, no. 1127, 1910; San tun ying, *F. N. Meyer*, no. 965, May 29, 1913; Ta miao, alt. 900 m., *J. Hers*, no. 2211, October 10, 1922; Ta hung men, *J. Hers*, no. 2214, October 10, 1922; Hsiao wu tai shan, *J. Hers*, no. 1475, July 14, 1921; Hsiao wu tai shan, southeastern valley, alt. 900–1500 m., *J. Hers*, no. 2202, October 9, 1922; Hsiao wu tai shan, Shui shih tao, alt. 1500 m., *J. Hers*, nos. 2169, 2178, October 8, 1922; Po hua shan, *J. Hers*, nos. 1389 and 1655, May 1 and September 9, 1921; Peking, British Legation, *W. Purdom*, no. 987, 1909; Peking, Temple of Heaven, *J. Hers*, no. 90, May 9, 1920; Ying tau ko, *F. N. Meyer*, no. 1286, September 12, 1913 (Herb. U. S. Dept. Agric.); Wen tow kow, *N. H. Cowdry*, no. 479, June 8, 1920; Tung ling, hills north of wall, *N. H. Cowdry*, no. 2161, May 18, 1921.—See also Bunge, l. c., Planchon, l. c., Maximowicz, l. c., Franchet, l. c. (Pl. David.), Schneider, l. c. and Cowdry, l. c.

SHANTUNG: Lung tung, *F. N. Meyer*, no. 247, September 28, 1907 (U. S. Dept. Agric.), no. 272, September, 1907.—See also Franchet, l. c. (Mém. Cherbourg), Faber, l. c., Seemen & Loesener, l. c., Meyer, l. c., Schneider, l. c., and Loesener, l. c.

HONAN: Teng feng hsien, Yu tai shan, *J. Hers*, nos. 229 and 280, April 23 and June 17, 1919; Sia shih, Shan show, alt. 700 m., *J. Hers*, no. 811, October 2, 1919; Yung ning, Yo tze ping, alt. 1000 m., *J. Hers*, no. 822, October 4, 1919; Yung ning, Tsi li ping, about 1100 m., *J. Hers*, nos. 411 and 1330, May 22 and September 30, 1919; Hwei hsien, Ping lo, *J. Hers*, no. 733, June 18, 1919; Hwei hsien, Pei yao, *J. Hers*, no. 809, June 18, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1715, September 20, 1921; Ho dien, *F. N. Meyer*, no. 1868, July 7, 1914.—See also Hers, l. c.

SHANSI: Hiao hsien, Huang lai kow, *J. Hers*, no. 1856, October 2, 1921.

SHENSI: "Ta see tsuen," *G. Giraldi*, September 15, 1897; northwest of Han cheng hsien, *W. Purdom*, no. 376, 1910.—See also Diels, l. c., Schneider, l. c.

KANSU: Liang tang, *F. N. Meyer*, no. 1674, September 25, 1914 (Herb.

U. S. Dept. Agric.), Tsing shui hsien, Ta liu shan, *J. Hers*, no. 2400, July 7, 1922.

DISTRIBUTION: also Kiangsu, Hupeh, Szechuan, Yunnan; Manchuria, Korea.

Young leaves of this species are occasionally more or less appressed pubescent, as Purdom's no. 376 from Shensi which has some branchlets nearly glabrous and others together with the petioles minutely but densely grayish pubescent with the leaves thinly appressed-pubescent; Hers' no. 229 from Honan is similar to the latter, but the fruiting specimen (no. 280) from the same locality is perfectly glabrous and a typical *C. Bungeana* except that the leaves are rather narrower. On vigorous shoots as Hers' no. 1330 the leaves may be scabrid above and more or less pilose beneath, while his no. 411 from the same locality has smooth and glabrous or nearly glabrous leaves. Cowdry's no. 479 and Hers' no. 2169 represent apparently a juvenile form with part of the leaves constricted about the middle into an elongated lanceolate or linear-lanceolate lobe.

Pteroceltis Tatarinowii Maximowicz in Bull. Acad. Sci. St. Pétersb. XVIII. 293, fig. (1873); in Bull. Soc. Nat. Moscou, LIV. 53 (Fl. As. Or. Fragm.) (1879).—Hemsley in Jour. Linn. Soc. XXVI. 451 (1894).—Pritzel in Bot. Jahrb. XXIX. 297 (1900).—Schneider in Sargent, Pl. Wilson. III. 284 (1916).—Bailey, Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 114 (1922); Liste Ess. Lign. Honan, 23 (1922).

Ulmi spec. nov. Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).

CHILI: Peking, cultivated, *A. Tatarinow* (ex Maximowicz, l. c. and Schneider, l. c.).

SHANTUNG: Lung tung, *F. N. Meyer*, no. 247, September 25, 1907.

HONAN: Kio shan, *L. H. Bailey*, June 22, 1917.—See also Bailey, l. c. and Hers, l. c.

SHANSI: Hia hsien, Huang lai kow, *J. Hers*, no. 1843, October 2, 1921 (sterile).

SHENSI: "Lao-y-san," *G. Giraldi*, September 6, 1897; Niu pei shan, alt. 700 m., *J. Hers*, no. 2450, October 11, 1922.—See also Maximowicz, l. c. (1879), Pritzel, l. c., Hemsley, l. c., and Schneider, l. c.

KANSU: Tsing chow, Mao kia chwang, alt. 1200 m., *J. Hers*, no. 2429, October 6, 1922.—See also Maximowicz, l. c. (1879), and Hemsley, l. c.

DISTRIBUTION: also Kiangsu (*Hers*, nos. 1014, 1062), Hupeh, Szechuan, Kweichou.

Hers' no. 2450 from Shensi is represented by sterile much branched specimens with short and thin branchlets and very small leaves measuring only 1.5–2 cm. in length, only a few at the end of some branchlets being up to 3 cm. long.

Hemiptelea Davidii Planchon in Compt. Rend. Acad. Paris, LXXIV. 132, 1496 (1872); in De Candolle Prodr. XVII. 165 (1873).—Maximowicz

in Bull. Acad. Sci. St. Pétersb. XVIII. 289; in Mél. Biol. IX. 22 (1873).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 78, t. 9 (Pl. David. I. 268) (1884).—Schneider in Sargent, Pl. Wilson. III, 288 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 111 (1922); Liste Ess. Lign. Honan, 15 (1922).

Planera ? vel genus novum Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).

Planera Davidii Hance in Jour. Bot. VI. 333 (1868).

Zelkova Davidii Hemsley in Jour. Linn. Soc. XXVI. 449 (1894).—Faber in Denkschr. Entwickel. Kiautschou. 29 (1898).—Seemen & Loesener in Bot. Jahrb. XXXIV. beibl. LXXV. 29 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 109 (1919).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 173 (Pl. Peitaiho) (1922).

CHILI: Weichang, *W. Purdom*, no. 296[bis], 1909; Jehol, *A. David* (Gray Herb.), *W. Purdom*, no. 296, 1909; San tun ying, *F. N. Meyer*, no. 990, June 2, 1913; Peitaho, East Cliff, *N. H. Cowdry*, no. 149, July, 1919; Wen tow kow, *N. H. Cowdry*, no. 482, June 8, 1920; near Peking, *C. A. Skatschkoff* (Gray Herb.).—See also Planchon, l. c., Maximowicz, l. c., Franchet, l. c., Hance, l. c., Hemsley, l. c. and Cowdry, l. c.

SHANTUNG: See Faber, l. c., Seemen & Loesener, l. c. and Loesener, l. c.

HONAN: See Hers, l. c.

SHENSI: Lung chow, Kuan shan, alt. 2000 m., *J. Hers*, no. 2334, July 3, 1922.

KANSU: Yin kwan dien, *F. N. Meyer*, no. 1678, September, 1914 (Herb. U. S. Dept. Agric.).

DISTRIBUTION: also Chekiang, Kiangsu, Hunan (*Handel-Mazzetti*, no. 12547); Manchuria, Korea.

Zelkova sinica Schneider in Sargent, Pl. Wilson. III. 286 (1916).—Bailey, Gent. Herb. I. 18 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 117 (1922); Liste Ess. Lign. Honan, 34 (1922).

Zelkova acuminata Hemsley in Jour. Linn. Soc. XXVI. 449 (1894), pro parte.—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 33 (1905).—Non Planchon.

HONAN: Yung ning, Tsi li ping, alt. 1100 m., *J. Hers*, nos. 403, 466, May 22, 1919; Sung hsien, San kuao miao, *J. Hers*, no. 552, May 24, 1919; Sia shih, Shan chow, alt. 700 m., *J. Hers*, no. 810, October 2, 1919; Hwei hsien, Pei yao, *J. Hers*, no. 82, June 18, 1919; Ku hsien, Kiang tze po, alt. 600 m., *J. Hers*, no. 843, Oct. 6, 1919; Lu shih, Tang ho, alt. 1000 m., *J. Hers*, no. 957, October 11, 1919; Sung hsien, Shih tze miao, *J. Hers*, no. 1294, September 25, 1919; Sung hsien, San kuan miao, alt. 1000 m., *J. Hers*, no. 1315, September 27, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1782, September 21, 1921; Kio shan, *L. H. Bailey*, June 23, 1917; without precise locality, *J. Hers*, no. 784.—See also Bailey, l. c. and Hers, l. c.

SHANSI: Pai dja dien, *F. N. Meyer*, no. 1637, September 18, 1914; Hia hsien, Hung lai kow, *J. Hers*, nos. 1832, 1839, October 2, 1921.

SHENSI: "Kian san," *G. Giraldi*, August 4, 1897; "Lao-y-san," G. Giraldi, 1897; Tai pei shan, *W. Purdom*, nos. 985, 986, 1910; Lung chow,

Kuan shan, alt. 2000 m., *J. Hers*, no. 2367, July 3, 1922.—See also Diels, l. c. and Schneider, l. c.

KANSU: near Yan pu ko, *F. N. Meyer*, no. 1641, October 7, 1914; Tchu tsai tze, *F. N. Meyer*, no. 1643, October 29, 1914.

DISTRIBUTION: also Hupeh, Kiangsu, Chekiang.

Aphananthe aspera Planchon in Ann. Sci. Nat. x. 265 (1848).—Schneider in Sargent, Pl. Wilson. III. 290 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 109 (1919).

SHANTUNG: Cape Yatau (ex Loesener, l. c.).

DISTRIBUTION: also Kiangsu (*Hers*, nos. 603, 2284, 2315), Chekiang, Kiangsi, Kwangtung, Hunan (*Handel-Mazzetti*, no. 11088); Korea, Japan, Formosa.

MORACEAE

Morus alba Linnaeus, Spec. 986 (1753).—Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 134 (Enum. Pl. Chin. Bor. 60) (1833).—Maximowicz in Mém. Div. Sav. Acad. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Debeaux in Act. Soc. Linn. Bordeaux, XXXI. 361 (Fl. Tché-foû, 128) (1876).—Hemsley in Jour. Linn. Soc. XXVI. 455 (1894).—Faber in Denkschr. Entwickel, Kiautschou, 30 (1898).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 29 (1904).—Schneider in Sargent, Pl. Wilson. III. 294 (1916).—Koidzumi in Bull. Imp. Seric. Exp. Sta. Jap. IX. 52, t. 10 (Rev. Gen. Morus) (1917).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 109 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII. 112 (1922); Liste Ess. Lign. Honan, 19 (1922).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaiho) (1922).

? *Morus constantinopolitana* Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 134 (Enum. Pl. Chin. Bor. 60) (1833).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Vix Poiret.

CHILI: without locality, *Père Chanet*, no. 71, 1919 (sterile).—See also Bunge, l. c., and Hemsley, l. c.

SHANTUNG: Tsingtau and Lau shan, *O. Nebel* (ex Gilg, l. c.).—See also Faber, l. c., Debeaux, l. c., and Loesener, l. c.

HONAN: without locality, *J. Hers* (probably planted).—See also Hers, l. c.

KANSU: Tsing chow, alt. 1280 m., *J. Hers*, no. 2404, July 15, 1922.

DISTRIBUTION: also Kiangsi, Hupeh, Szechuan, Yunnan; India, Japan.

Morus alba seems to occur only as a cultivated plant in northern China; the specimens from near Peking, enumerated by Hemsley (l. c.) probably belong to other species. Père Chanet's specimen from Chili and J. Hers' specimen from Honan, both without exact locality, are probably from cultivated plants and so are probably Nebel's specimens from Shantung cited by Gilg (l. c.) and by Loesener (l. c.) who also cite for the same localities *M. nigra* L. which is mentioned by Fauvel (in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 253 [1884]) as being cultivated near Chi fu. These

citations in all probability refer to a black-fruited form of *M. alba; M. nigra* is not known to be cultivated in China.

Of *Morus alba* var. *laciniata* Beiss. cited by Hers (l. c.) as occurring in Honan, I have seen no specimens; *M. alba* var. *laciniata* Beiss., not K. Koch, is a synonym of *M. alba* f. *skeletoniana* Schneid. and is a garden form which originated in North America.

Morus cathayana Hemsley in Jour. Linn. Soc. XXVI. 456 (1894).—Schneider in Sargent, Pl. Wilson. III. 292 (1916).—Koidzumi in Bull. Imp. Seric. Exp. Sta. Jap. IX. 42 (Rev. Gen. Morus) (1917).

HONAN: Lu shih, Lao kiun shan, alt. 2000 m., *J. Hers*, September 21, 1919.

SHENSI: Lung chow, Lia kiao po, alt. 1800 and 1400 m., *J. Hers*, nos. 2371 and 2381, July 4, 1922.

DISTRIBUTION: also Kiangsu, Chekiang, Hupeh, Szechuan, Hunan (*Handel-Mazzetti*, no. 12106).

The three specimens cited are sterile, but according to shape, serration and pubescence of the leaves they apparently belong here, though no. 2381 has the leaves deeply lobed, a shape not common in this species.

Morus mongolica Schneider in Sargent, Pl. Wilson. III. 296 (1916).—Koidzumi in Bull. Imp. Seric. Exp. Sta. Jap. IX. 29, t. 1, fig. b c (Rev. Gen. Morus) (1917).

Morus alba var. *mongolica* Bureau in De Candolle, Prodr. XVII. 241 (1873).

CHILI: "ad Gehol," *A. David* (no. 1804, partly, ex Bureau); Pan shan, highest temple grounds, *N. H. Cowdry*, no. 1244, May 18, 1921.

HONAN: Yung ning, Tsi li ping, alt. 1000 m., *J. Hers*, no. 1353, September 30, 1919.

SHANSI: Hia hsien, Huang lai kow, *J. Hers*, no. 1861, October 2, 1921.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan; Manchuria, Korea.

Morus mongolica var. **diabolica** Koidzumi in Tokyo Bot. Mag. XXXI. 36 (1917); in Bull. Imp. Seric. Exp. Sta. Jap. IX. 30, t. 1, fig. a (Rev. Gen. Morus) (1917).

Morus alba var. *mongolica* Bureau in De Candolle, Prodr. XVII. 242 (1873), quoad plantam foliis pubescentibus.

CHILI: "ad Gehol," A. David (no. 1804, partly, ex Bureau); Pan shan, temple garden wall, *N. H. Cowdry*, no. 1306, May 16, 1921; Hsiao wu tai shan, southeastern valley, alt. 900–1500 m., *J. Hers*, no. 2201, October 9, 1922; Ta lung men, *J. Hers*, no. 2218, October 10, 1922.

SHENSI: Tai pei shan, *W. Purdom*, no. 981, 1910.

DISTRIBUTION: also Kiangsu (*Hers*, no. 2316); Korea (ex Koidzumi, l. c.).

This variety resembles in its pubescence *M. cathayana* Hemsl., but it has the aristate teeth of *M. mongolica*. From *M. mongolica* var. *vestita* Rehd. which is also pubescent, it differs in its much larger deeply lobed

leaves, from 10–17 cm. long, while those of var. *vestita* are undivided and only 4–7 cm. long.

Morus acidosa Griffith, Not. Pl. As. IV. 388 (1854).—Schneider in Sargent, Pl. Wilson. III. 296 (1916).—Koidzumi in Tokyo Bot. Mag. XXXI. 37 (1917); in Bull. Imp. Seric. Exp. Sta. Jap. IX 34, t. 4 (1917).—Hers in Jour. N. China Branch R. As. Soc. LIII. 112 (1922); Liste Ess. Lign. Honan, 19 (1922).

Morus bombycis Koidzumi l. c. 36 (1917); l. c. 32, t. 2 (1917).

CHILI: Peking, on city wall, *F. N. Meyer*, no. 1382, April 30, 1913 (staminate flowers).

HONAN: Sung hsien, San kuan miao, alt. 1200 m., *J. Hers*, no. 509, May 24, 1919 (pistillate flowers); Sung hsien, Shih tze miao, alt. 1200 m., *J. Hers*, no. 1250, September 25, 1919 (sterile).

DISTRIBUTION: also Hupeh, Szechuan, Yunnan, Kweichou, Kwangtung; Formosa, Japan, Himalayas.

Broussonetia papyrifera L'Héritier in Ventenat, Tabl. Règn. Vég. III. 547 (1799).—Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 135 (Enum. Pl. Chin. Bor. 61)(1833).—Turczaninow in Bull. Soc. Nat. Moscou, X. no. VII. 157 (1837).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).—Debeaux in Act. Soc. Linn. Bordeaux, XXXIII. 63 (Fl. Tien-tsin, 40) (1879).—Hemsley in Jour. Linn. Soc. XXVI. 455 (1894).—Pritzel in Bot. Jahrb. XXIX. 298 (1900).—Schneider in Sargent, Pl. Wilson. III. 303 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 109 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII. 107 (1922); Liste Ess. Lign. Honan, 5 (1922).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 174 (Pl. Peitaiho) (1922).

CHILI: Peking, on city wall, *F. N. Meyer*, nos. 928, 1016, May 20 and July 12, 1913.—See also Bunge, l. c., Turczaninow, l. c., Debeaux, l. c., and Schneider, l. c.

SHANTUNG: near Chi ning chou, *F. N. Meyer*, no. 381, August, 1907 (*f. variegata* Ser.; Herb. U. S. Dept. Agric.); Cape Jaeschke, *O. Nebel* (ex Loesener, l. c.).

HONAN: Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1703, September 17, 1921.

SHANSI: Hia hsien, Huang lai kow, *J. Hers*, no. 1829, October 2, 1921.

SHENSI: In kia pu, *G. Giraldi* (no. 1637, ex Pritzel, l. c.).

DISTRIBUTION: also Kiangsu, Hupeh, Szechuan, Yunnan, Hunan, Chekiang, Kwantung, Hainan; Formosa, Korea, India, Malaysia, Polynesia.

Probably only planted and naturalized in Chili; also cultivated and naturalized in Japan.

Broussonetia Kaempferi Siebold in Verh. Bat. Genoot. XII. 28 (Syn. Pl. Oecon. Jap.) (1830).—Schneider in Sargent, Pl. Wilson. III. 304

(1916).—Bailey, Gent. Herb. I. 19 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 107 (1922); Liste Ess. Lign. Honan, 5 (1922).

HONAN: Lu shih, Lao kiun shan, alt. 2000 m., *J. Hers*, no. 1208, September 21, 1919; Chi kung shan, *L. H. Bailey*, June 8, 1917.—See also Hers, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan, Hunan, Chekiang, Fokien, Kwangtang; Formosa, Korea, Japan.

Cudrania tricuspidata Bureau in Lavallée, Arb. Segrez. 243 (1877).—Schneider in Sargent, Pl. Wilson. III. 306 (1916).—Bailey, Gent. Herb. I. 19 (1920).—Hers in Jour. N. China Branch R. As. Soc. LIII. 109 (1922); Liste Ess. Lign. Honan, 10 (1922).

Cudranus trilobus Hance in Jour. Bot. VI. 49 (1868); XIV. 365 (1876).

Cudrania triloba Forbes in Jour. Bot. XXI. 145 (1883).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 253 (1884).—Faber in Denkschr. Entwickel. Kiautschou, 30 (1898).—Hemsley in Jour. Linn. Soc. XXVI. 470 (1899).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 33 (1905).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 109 (1919).

SHANTUNG: Ocean bluff near Chifu, *C. S. Sargent*, September 22, 1903; Chifu, *N. H. Cowdry*, nos. 620 and 621, June 23 and August 1, 1920.—See also Hance, l. c., Franchet, l. c., Hemsley, l. c., Schneider, l. c. and Loesener, l. c.

HONAN: Teng feng, Yu tai shan, alt. 800 m., *J. Hers*, no. 293, June 17, 1919; Sung hsien, Shih tze miao, alt. 1200 m., *J. Hers*, no. 591, May 26, 1919.

SHENSI: Lung chow, Kuan shan, alt. 2000 m., *J. Hers*, no. 2335, July 3, 1922; King lung shan, alt. 900 m., *J. Hers*, no. 2441, October 9, 1922; Niu pei shan, alt. 700 m., *J. Hers*, no. 2453, October 11, 1922.—See also Diels, l. c.

DISTRIBUTION: also Kiangsu, Chekiang, Kiangsi, Hupeh, Hunan, Yunnan; Korea, Japan.

Ficus Baileyi Hutchinson in Bailey, Gent. Herb. I. 19 (1920).

HONAN: Chi kung shan, *L. H. Bailey*, June 13, 1917 (ex Bailey, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Kiangsi, Chekiang.

Ficus pumila Linnaeus, Spec. 1060 (1753).—Hemsley in Jour. Linn. Soc. XXVI. 465 (1899).—Schneider in Sargent, Pl. Wilson. III. 311 (1916).—Bailey, Gent. Herb. I. 20 (1920).

HONAN: Chi kung shan, *L. H. Bailey* (ex Bailey, l. c.).

DISTRIBUTION: also Kiangsu, Chekiang, Kiangsi, Hupeh, Kwangsi, Kwangtung, Fokien; Formosa, Japan.

Ficus heteromorpha Hemsley in Hooker, Icon. Pl. XXVI. tt. 2533, 2534 (1897).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 34 (1905).—Schneider in Sargent, Pl. Wilson. III. 311 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 110 (1922); Liste Ess. Lign. Honan, 13 (1922).

HONAN: Mien chih, alt. 800 m., *J. Hers*, nos. 61, 62, August 20, 1919; Lu shih, Lung shui, alt. 1100 m., *J. Hers*, no. 124, October 4, 1918; Lushih, Lao kiun shan, alt. 2000 m., *J. Hers*, September 21, 1919; Teng feng hsien, alt. 600 m., *J. Hers*, no. 227, April 23, 1919; Sung hsien, San kuan miao, alt. 1400 m., *J. Hers*, no. 528, May 24, 1919; Sung hsien, Shi tze miao, *J. Hers*, nos. 576, 577 and 1247, May 26 and September 25, 1919.—See also Hers, l. c.

SHENSI: Tai pei shan, *W. Purdom*, no. 982, 1910.—See also Diels, l. c.

DISTRIBUTION: also Kiangsi, Hupeh, Szechuan, Hunan (*Handel-Mazzetti*, nos. 11782, 12225, 12228), Yunnan (*Siméon Ten*, no. 398), Fokien (*Warburg*, no. 5901; *Hongkong Herb.*, no. 3448); Liukiu Islands (*Yokohama Nursery Co.*).

This species with deciduous leaves is the only Ficus which has a wider distribution in northern China; the two preceding species which are evergreen just reach the southern border of Honan and the following species extends from Hupeh only to southern Shensi.

Ficus tikoua Bureau in Jour. de Bot. II. 213, t. 7 (1888).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 34 (1905).

SHENSI: *G. Giraldi*, no. 44 (ex Diels, l. c.).

DISTRIBUTION: also Hupeh, Hunan (*Handel-Mazzetti*, no. 12588), Yunnan.

URTICACEAE

Boehmeria platanifolia Franchet & Savatier, Enum. Pl. Jap. I. 440 (1875).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 110 (1919).

SHANTUNG: Lau shan (ex Loesener, l. c.).

DISTRIBUTION: also Kiangsi, Hupeh, Szechuan; Japan.

Boehmeria spicata Thunberg in Trans. Linn. Soc. II. 330 (1794).—Maximowicz in Bull. Sci. Acad. St. Pétersb. XXII. 2 (1876); in Mél. Biol. IX. 645 (1877).—Hemsley in Jour. Linn. Soc. XXVI. 488 (1899).

Boehmeria spec. Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 477 (Ind. Fl. Pekin.) (1859).

Boehmeria platyphylla var. *japonica* Weddell in De Candolle, Prodr. XVI. pt. I. 213 (1869).—Pritzel in Bot. Jahrb. XXIX. 304 (1900).— Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 110 (1919).

CHILI: Peking, *E. Bretschneider*, *Tatarinow* (ex Maximowicz, l. c. and ex Hemsley, l. c.).

SHANTUNG: Lau shan, Cape Yatau (ex Loesener, l. c.).

SHENSI: *G. Giraldi* (ex Pritzel, l. c.).

DISTRIBUTION: also Japan.

I have seen no specimens of Boehmeria from Chili or from Shensi, but assume that the specimens from these two provinces belong to the same species.

Boehmeria platyphylla D. Don, Prodr. Fl. Nepal. 60 (1825).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 29 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II, 110 (1919).—Bailey, Gent. Herb. I. 20 (1920).

SHANTUNG: Tsingtau, *R. Zimmermann*, no. 445, 1901.—See also Gilg, l. c. and Loesener, l. c.

HONAN: Chi kung shan, *L. H. Bailey*, 1917 (ex Bailey, l. c.); Kio shan, *L. H. Bailey*, 1917 (ex Bailey, l. c.).

DISTRIBUTION: also China, Himalayas, Formosa.

Boehmeria platyphylla var. **macrophylla** Weddell in De Candolle Prodr. XVI. pt. I. 213 (1869).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 110 (1919).

SHANTUNG: Cape Yatau (ex Loesener, l. c.).

DISTRIBUTION: also China, Japan.

Boehmeria nivea Gaudichaud in Freycinet, Voy. Bot. 499 (1826).—Wright in Jour. Linn. Soc. XXVI. 486 (1894).—Pritzel in Bot. Jahrb. XXIX. 304 (1900).

SHENSI: *P. J. Piasezki* (ex Wright, l. c., and Pritzel, l. c.).

DISTRIBUTION: also elsewhere in China; Japan, Malay Archipelago.

LORANTHACEAE

Loranthus europaeus Jacquin, Enum. Stirp. Vindob. 230, t. 3 (1762).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 71 (Pl. David. I. 261) (1884).

CHILI: Peking, *A. David*, no. 441 (ex Franchet, l. c.).

DISTRIBUTION: also Szechuan; Japan; eastern Europe, western Asia to Kurdistan.

I have seen no specimens of *L. europaeus* from eastern Asia, but Professor Lecomte informs me that in the herbarium of the Museum at Paris there is a specimen from Szechuan collected by Farges and several specimens from Japan. According to David it is found on Elm and also on Apricot.

Loranthus yadoriki Siebold apud Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 229 (1876); Mél. Biol. IX. 609 (1877).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 34 (1905).

Loranthus Jodoniki Siebold apud Siebold & Zuccarini in Abh. Akad. Muench. IV. 193 (Fam. Nat. Jap. I. 85) (1846), nomen.

SHENSI: "Ki fon shan" near "Pao ki scen," *G. Giraldi*, no. 5998 (ex Diels, l. c.).

DISTRIBUTION (including var. *hupehanus* Lecomte): also Hupeh, Szechuan, Chekiang (*H. H. Hu*, no. 465), Kwangtung (*R. Mell*, no. 866); Korea, Japan.

As I have not seen Giraldi's specimen, I cannot say if his no. 5998 represents the type or the var. *hupehanus* Lecomte (in Sargent, Pl. Wilson. III. 315 [1916]) which differs in the grayish color of the tomentum of the under side of the leaves.

Viscum album Linnaeus, Spec. 1023 (1753).—Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 2 (1876); in Mél. Biol. IX. 615 (1877).—Franchet in Mem. Soc. Sci. Nat. Cherbourg, XXIV. 251 (1884); in Nouv. Arch. Mus. Paris, sér. 2, VII. 71 (Pl. David. I. 261) (1884).—Faber in Denkschr. Entwickel. Kiautschou, 30 (1898).—Hemsley in Jour. Linn. Soc. XXVI. 407 (1899).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 29 (1904).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 34 (1905).—Lecomte in Sargent, Pl. Wilson. III. 318 (1916).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 111 (1919).—Hers in Jour. N. China Branch R. As. Soc. LIII. 117 (1922); Liste Ess. Lign. Honan, 33 (1922).

CHILI: Weichang, *W. Purdom*, no. 64, 1909.—See also Maximowicz, l. c. and Franchet, l. c. (Pl. David.).

SHANTUNG: See Faber, l. c., Hemsley, l. c., Franchet, l. c. (Mém. Cherbourg), Gilg, l. c. and Loesener, l. c.

HONAN: Shan chow, Chang tsun, alt. 800 m., *J. Hers*, no. 817, October 3, 1919.—See also Hers, l. c.

SHENSI: "Fu kio, Huo kia zaez", *G. Giraldi* (ex Diels, l. c.).

DISTRIBUTION: also Europe to India, Japan, Manchuria and Korea.

This species seems to grow chiefly on Poplars, Willows and Elms and according to Giraldi also, though rarely, on Quercus. Franchet states that the form with yellow fruit is found chiefly on Populus, that with red fruit on Ulmus. The latter form has been distinguished as var. *rubro-aurantiacum* Makino (in Tokyo Bot. Mag. XVIII. 67 [1904]).

Korthalsella fasciculata Lecomte in Bull. Hist. Nat. Mus. Paris, 1916, 266.

Viscum articulatum Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 72 (Pl. David. I. 262) (1884); non Burmann f.

Viscum japonicum Hemsley in Jour. Linn. Soc. XXVI. 407 (1894), quoad specimen e Shensi.—Pritzel in Bot. Jahrb. XXIX. 305 (1900).—Non Thunberg.

Bifaria Davidiana Van Tieghem in Bull. Soc. Bot. France, XLIII. 173 (1896).

Bifaria fasciculata Van Tieghem, l. c. 174 (1896).

SHENSI: Tsin ling shan, *A. David* (ex Franchet, l. c., Hemsley, l. c., Pritzel, l. c. and Lecomte, l. c.).

DISTRIBUTION: also Szechuan.

This species of which I have seen no specimen had been identified by Franchet with *Viscum articulatum* Burm. and by Hemsley and Pritzel with *Viscum japonicum* Thunb. now referred to *Korthalsella Opuntia* Merrill.[1]

[1] **Korthalsella Opuntia** (Thunb.) Merrill in Tokyo Bot. Mag. XXX. 68 (1916).

Viscum opuntia Thunberg, Fl. Jap. 64 (1784).

Viscum japonicum Thunberg in Trans. Linn. Soc. II. 329 (1794).—Hemsley in Jour. Linn. Soc. XXVI. 407 (1894).—Pritzel in Bot. Jahrb. XXIX. 305 (1900).

Korthalsella japonica Engler in Nat. Pflanzenfam. Nachtr. I. 138 (1897).

Pseudixus japonicus Hayata in Tokyo Bot. Mag. XXIX. (166) (1915); XXX. 69 (1916); Icon. Pl. Formos. V. 188, fig. 64 (1915).

Korthalsella moniliformis (Wight) Lecomte in Bull. Hist. Nat. Mus. Paris, 1916, 265.

SANTALACEAE

Buckleya lanceolata Miquel, Cat. Mus. Bot. Lugd.-Bat. Fl. Jap. 79 (1870).—Hemsley in Jour. Linn. Soc. XXVI. 409 (1894).—Hers in Jour. N. China Branch R. As. Soc. LIII. 107 (1922); Liste Ess. Lign. Honan, 5 (1922).

Buckleya Henryi Diels in Bot. Jahrb. XXIX, 306 (1900); XXXVI. beibl. LXXXII. 34 (1905).

HONAN: Sung hsien, Shih tze miao, *J. Hers*, no. 565, May 26, 1919; Lu shih, Hiung eul shan, alt. 1400 m., *J. Hers*, no. 931, October 10, 1919; Lu shih, Lao kiun shan, alt. 2000 m., *J. Hers*, no. 1192, September 21, 1919.

SHENSI: Lao y shan, *G. Giraldi*, 1897; Tai pei shan, *W. Purdom*, nos. 935 and 936, 1910

DISTRIBUTION: also Hupeh, Szechuan; Japan.

None of the specimens cited above have fruits and it is therefore impossible to say if they belong to the typical form or to the form described as *B. Henryi* by Diels.

Buckleya Graebneriana Diels in Bot. Jahrb. XXIX. 306 (1900).

SHENSI: In kia pu, *G. Giraldi*, no. 1061, and Si ku tziu shan, *G. Giraldi*, no. 1060 (ex Diels, l. c.).

ARISTOLOCHIACEAE

Aristolochia setchuenensis Franch. var. **holotricha** Diels in Bot. Jahrb. XXIX. 310 (1900).

SHENSI: Hua tzo pin, *G. Giraldi* (ex Diels, l. c.).

Aristolochia manshuriensis Komarov in Act. Hort. Petrop. XXII. 112 (Fl. Mansh.) (1904).—Nakai in Jour. Coll. Sci. Tokyo, XXXI. 176 (Fl. Kor. II.) (1911).—Mori, Enum. Pl. Corea, 128 (1922).

Aristolochia sp. Hers in Jour. N. China Branch R. As. Soc. LIII. 107 (1922); Liste Ess. Lign. Honan, 4 (1922).

HONAN: Hwei hsien, Pai yun sze, *J. Hers*, no. 791, June 15, 1919.—See also Hers, l. c.

DISTRIBUTION: also Manchuria, northern Korea.

The specimen is sterile, but it agrees perfectly in shape, size and pubescence of its leaves with specimens from Manchuria and northern Korea.

Aristolochia contorta Bge. which occurs in Chili and *A. debilis* Sieb. & Zucc. reported from Shantung are herbaceous species and therefore do not enter into this enumeration.

POLYGONACEAE

Polygonum multiflorum Thunberg, Fl. Jap. I. 169 (1784).—Schneider in Sargent, Pl. Wilson. III. 325 (1916).—Hers in Jour. N. China Branch R. As. Soc. LIII. 113 (1922); Liste Ess. Lign. Honan, 22 (1922).

HONAN: Shan chow, Shang mao, alt. 700 m., *J. Hers*, no. 813, October 2, 1919.

DISTRIBUTION: also Kiangsu, Hupeh, Szechuan, Fokien; Formosa, Manchuria, Korea, Japan.

Polygonum cuspidatum Sieb. & Zucc. (= *P. Sieboldii* De Vriese) enumerated by Hers (l. c.) is an herbaceous species.

CHENOPODIACEAE

Eurotia ceratoides C. A. Meyer apud Ledebour, Fl. Alt. IV. 239 (1833).—Moquin-Tandon in De Candolle, Prodr. XIII. pt. II. 120 (1849).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, VII. 57 (Pl. David. I. 249) (1884).—Hemsley in Jour. Linn. Soc. XXVI. 326 (1894).

CHILI: Peking, *A. David* (ex Franchet, l. c., and Hemsley, l. c.).

DISTRIBUTION: also western Europe and through central Asia to Manchuria.

TROCHODENDRACEAE

Euptelea Franchetii Van Tieghem in Jour. de Bot. XIV. 272 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. I. 314 (1913).—Hers in Jour. N. China Branch R. As. Soc. LIII. 110 (1922); Liste Ess. Lign. Honan, 13 (1922).

Euptelea pleiosperma Maximowicz in Act. Hort. Petrop. XI. 39 (1890); non Hooker f. & Thomson.

Euptelea polyandra Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 45 (1905); non Siebold & Zuccarini.

HONAN: Sung hsien, San kuan miao, *J. Hers*, no. 549, May 24, 1919; Sung hsien, Shih tze miao, alt. 1200 m., *J. Hers*, no. 1244, September 25, 1919; Lushih, Hiung eul shan, alt. 1400 m., *J. Hers*, nos. 925 and 930, October 10, 1919; Lushih, Lao kiun shan, alt. 2000 m., *J. Hers*, nos. 1148 and 1177, September 21, 1919; Lushih, Kiao ho, alt. 1000 m., *J. Hers*, no. 972, October 13, 1919; Yung ning, Tsi li ping, alt. 1000 m., *J. Hers*, no. 1340, September 30, 1919; Tsi yuan hsien, Tien tan shan, *J. Hers*, no. 1798, September 21, 1921.—See also Hers, l. c.

SHENSI: "Kin-tou-san," *G. Giraldi*, July, 1897; "Thui kio tsuen, Miao-wang-san, Houan-tou-san, Kan-y-san, Ngo-san, Lao-y-san and Lean-san," *Hugh Scallan*, 1899; Tai pei shan, *W. Purdom*, no. 1036, 1910.—See also Diels, l. c., and Rehder & Wilson, l. c.

KANSU: "ad fl. Dshombunon", *G. N. Potanin* (ex Maximowicz, l. c.).

DISTRIBUTION: also Hupeh, eastern Szechuan.

CERCIDIPHYLLACEAE

Cercidiphyllum japonicum Sieb. & Zucc. var. **sinense** Rehder & Wilson in Sargent, Pl. Wilson. I. 316 (1913).

SHENSI: southern slope of the Tai pei shan, alt. 2300 m., *W. Purdom*, no. 1107, 1910.—See also Rehder & Wilson, l. c.

DISTRIBUTION: also Hupeh, Szechuan.

Southern Shensi marks the northern limit of the range of this tree.

RANUNCULACEAE

Paeonia suffruticosa Andrews, Bot. Rep. VI. t. 373 (1804).—Rehder & Wilson in Sargent, Pl. Wilson. I. 319 (1913).

Paeonia Moutan Sims in Bot. Mag. XXIX. t. 1154 (1809).—Prantl in Engler & Prantl, Nat. Pflanzenfam. III. 2, 55, (1888).—Bretschneider, Hist. Eur. Bot. Disc. China, 425 (1898).

Paeonia Moutan forma *humilis* Pritzel in Bot. Jahrb. XXIX. 324 (1900).

Paeonia suffruticosa var. *spontanea* Rehder in Jour. Arnold Arb. I. 193 (1920).

SHENSI: Ki san, *Hugh Scallan*, and Gniu ju and Lun shan, *G. Giraldi* (ex Pritzel, l. c.); 50 li west of Yenan fu, *W. Purdom*, no. 338, 1910; Tai pei shan, *W. Purdom*, no. 1128, 1910; Han ch'eng, Moutan shan, (ex Bretschneider, l. c.).—See also Rehder & Wilson, l. c. and Rehder, l. c.

KANSU: north of the Hoang ho (ex Prantl, l. c.); Hung si hsien, alt. about 1400 m., *J. Hers*, no. 2417, August 2, 1922.

The recent collection of this species by native collectors for Mr. Hers tends to confirm the statement made by Prantl (l. c.) that the Moutan occurs wild in Kansu, though no mention is made that the specimen came from wild plants. Whether the two names given to the wild plants from Shensi by Pritzel and by myself represent different forms I am unable to say, as I have not seen Scallan's and Giraldi's specimens and Pritzel gives no description except "25 cm. alt."; Purdom's specimens are certainly taller, but the living plants raised from his seeds do not seem to grow as high as the cultivated garden forms.

Clematis pogonandra Maximowicz in Act. Hort. Petrop. XI. 8 (1890).—Rehder & Wilson in Sargent, Pl. Wilson. I. 319 (1913).

SHENSI: Tai pei shan, *W. Purdom*, no. 1138, 1910.—See also Rehder & Wilson, l. c.

KANSU: Idshu-san, *G. N. Potanin* (ex Maximowicz, l. c.).

DISTRIBUTION: also Hupeh, Szechuan.

Clematis heracleifolia De Candolle, Syst. I. 138 (1818).—Hemsley in Jour. Linn. Soc. XXIII. 4 (1886).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 34 (1904).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 545 (1903); Contrib. Fl. As. Or. I. 31 (1905).—Rehder & Wilson in Sargent, Pl. Wilson. I. 320 (1913).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 122 (1919).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 159 (Pl. Peitaiho) (1922).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 373.

Clematis tubulosa Turczaninow in Bull. Soc. Nat. Moscou X. no. VII. 148 (1837).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 468 (Ind. Fl. Pekin.) (1859); in Bull. Acad. Sci. St. Pétersb. XXII. 214 (1876); Mél. Biol. IX. 589 (1876).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, V. 165 (Pl. David. I. 13) (1882).

Clematis heracleifolia var. *Davidiana* Hemsley in Jour. Linn. Soc. XXIII. 4 (1886).

CHILI: *G. L. Staunton* (ex De Candolle, l. c.); Wo fu ssu, *N. H. Cowdry*, no. 1009, September 27, 1920; Peitaiho, *N. H. Cowdry*, no. 362, September 1, 1919; Chang li, *F. N. Meyer*, no. 204, November, 1905 (Herb. U. S. Dept.

Agric.); Ying tou ko, *F. N. Meyer*, no. 1285, September 12, 1913; Hsiao wu tai shan, Shui shih tao, alt. 1500 m., *J. Hers*, no. 2181, October 8, 1922; Jehol, *W. Purdom*, no. 218, 1909 (seeds only; plants raised from this seed growing in the Arnold Arboretum).—See also Franchet, l. c., Hemsley, l. c., Finet & Gagnepain, l. c., Cowdry, l. c., and Limpricht, l. c.

SHANTUNG: Chifu mountains, *E. Faber*, no. 253 (Gray Herb.); Cape Yatau, *R. Zimmermann*, no. 452 (ex Gilg, l. c.); without precise locality, "Zim, 624, 1. 9. 02" ex Herb. Hongkong Bot. Gard., and *A. C. Maingay*, no. 106.—See also Hemsley, l. c. and Loesener, l. c.

DISTRIBUTION (of the type): also Korea.

Clematis heracleifolia var. **ichangensis**, Rehder & Wilson in Sargent, Pl. Wilson. I. 321 (1913).

Clematis heracleifolia Pritzel in Bot. Jahrb. XXIX. 332 (1900); non De Candolle.

SHENSI: Huan tuo san, *G. Giraldi*, September 10–20, 1897; Tai pei shan, *W. Purdom*, no. 1010, 1910.—See also Pritzel, l. c. and Rehder & Wilson, l. c.

DISTRIBUTION: also Hupeh.

Clematis Tatarinowii Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 215 (1876); in Mél. Biol. IX. 560 (1876).

CHILI: Peking, *A. Tatarinow* (ex Maximowicz, l. c.).

I have seen no specimen of this species and it is not mentioned by Hemsley nor by Finet & Gagnepain. It is apparently related to the preceding species.

Clematis fusca Turczaninow in Bull. Soc. Nat. Moscou, XIII. 60 (1840).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 546 (1903); Contrib. Fl. As. Or. I. 32 (1905).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 123 (1919).

SHANTUNG: Lau shan (ex Loesener, l. c.).

DISTRIBUTION: also Manchuria, Korea, Japan.

Clematis lasiandra Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 213 (1876); in Mél. Biol. IX. 586 (1876).—Rehder & Wilson in Sargent, Pl. Wilson. I. 322 (1913).

SHENSI: Tai pei shan, *W. Purdom*, no. 1139, 1910.—See also Rehder & Wilson.

DISTRIBUTION: also Hupeh, Szechuan, Hunan (*Handel-Mazzetti*, no. 12730); Japan.

Clematis florida Thunberg, Fl. Jap. 240 (1784).—Rehder & Wilson in Sargent, Pl. Wilson. I. 325 (1913).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 123 (1919).

SHANTUNG: Lau shan and Cape Yatau (ex Loesener, l. c.).

DISTRIBUTION: also Hupeh, Hunan (Handel-Mazzetti, nos. 11957, 11997); Indochina, Japan.

Clematis fruticosa Turczaninow in Bull. Soc. Nat. Moscou, v. 180 (1832).—Maximowicz, Enum. Pl. Mongol. 2 (1889); in Act. Hort. Petrop. XI. 5 (1890).—Pritzel in Bot. Jahrb. XXIX. 331 (1900).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 537 (1903); Contrib. Fl. As. Or. I. 22 (1905).—Rehder & Wilson in Sargent, Pl. Wilson. I. 326 (1913).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 374 (1922).

CHILI: near Shih wen, *F. N. Meyer*, no. 1078, August 3, 1913; near Hui yan ku, *F. N. Meyer*, no. 1271, September 2, 1913.—See also Turczaninow, l. c., and Limpricht, l. c.

SHANSI: Wu chai hsien, alt. 2000–3000 m., *Tchueng Kieh*, J. Hers, no. 2051, September 7, 1922.—See also Maximowicz, l. c. (1890) and Finet & Gagnepain, l. c.

SHENSI: Fu kio, *G. Giraldi* (ex Pritzel, l. c.).

KANSU: *N. M. Przewalski* and *G. N. Potanin*, (ex Maximowicz, l. c. [1889, 1890]).

DISTRIBUTION: also Szechuan; Mongolia.

The specimens seen belong to the var. *lobata* Maximowicz (Enum. Pl. Mongol. 3 [1889]).

Clematis fruticosa var. **tomentella** Maximowicz, Fl. Tangut. 2 (1889).

KANSU: Bayan gol, *G. N. Potanin* (ex Maximowicz, l. c.).

Clematis nannophylla Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 305 (1877); in Mél. Biol. IX. 707 (1887); Fl. Tangut. 2, t. 1, figs. 1–9 (1889).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 537 (1903); Contrib. Fl. As. Or. I. 22 (1905).

Clematis nannophylla var. *foliosa* Maximowicz in Act. Hort. Petrop. XI. 5 (1890).

KANSU: Lotani, south of Min chou, alt. 2500 m., *W. Purdom*, no. 1027, 1910; Yan pu ko, *F. N. Meyer*, no. 1786, October 7, 1914; Chieh chon, *F. N. Meyer*, no. 1794, October 10, 1914 (Herb. U. S. Dept. Agric.).—See also Maximowicz, l. c.

The specimens seen belong to var. *foliosa* Maxim., if this form is sufficiently distinct to be maintained.

Clematis obscura Maximowicz in Act. Hort. Petrop. XI. 6 (1890).—Rehder & Wilson in Sargent, Pl. Wilson. I. 329 (1913).

? *Clematis Benthamiana* Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 790 (Pl. Enum. 1) (1891); in Szechenyi, Wiss. Ergeb. Reise Ostas. II. 676 (1898); vix Hemsley.

SHENSI: northwest of Hang cheng hsien, *W. Purdom*, no. 382, 1910.

KANSU: Valley of Poiho, between Terga and Rasa, and near Nan ping, *G. N. Potanin* (ex Maximowicz, l. c.).—See also Kanitz, l. c.

DISTRIBUTION: also Hupeh, Szechuan.

To this species I have referred the plant collected by Loczy in Kansu and determined by Kanitz as *C. Benthamiana* Hemsl., as it appears very unlikely that the latter, which seems to be confined to eastern China, occurs in Kansu, while the closely related and similar *C. obscura* Maxim. is a Kansu plant based on material collected by Potanin.

Clematis chinensis Retzius, Observ. II. 18, no. 53, t. 2 (1781).—Pritzel in Bot. Jahrb. XXIX. 332 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. I. 329 (1913).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 123 (1919).

SHANTUNG: Cape Jaeschke (ex Loesener, l. c.).

SHENSI: Ki san, Pao ki, *Hugh Scallan* in Giraldi, no. 869 (ex Pritzel, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Hunan (*Handel-Mazzetti*, no. 11278), Fokien; Formosa.

Clematis chinensis var. **vestita** Rehder & Wilson in Sargent, Pl. Wilson. I. 330 (1913).—Bailey, Gent. Herb. I. 23 (1920).

HONAN: Chi kung shan, *L. H. Bailey* (ex Bailey, l. c.).

DISTRIBUTION: also Hupeh.

Clematis Benthamiana Hemsley in Jour. Linn. Soc. XXIII. 2 (1886).—Rehder & Wilson in Sargent, Pl. Wilson. I. 330 (1913).—Bailey, Gent. Herb. I. 23 (1920).

Clematis Pavoliniana Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 8 (1922); non Pampanini.

HONAN: near Liu hsien, *F. N. Meyer*, no. 1848, July 5, 1914; Ho dien, *F. N. Meyer*, no. 1863, July 7, 1914 (Herb. U. S. Dept. Agric.); Yung ning, Tsi li ping, *J. Hers*, no. 448, May 22, 1919; Sia shih, *J. Hers*, no. 349, May 25, 1921.—See also Bailey, l. c.

DISTRIBUTION: also Hupeh, Chekiang, Fokien, Chusan Archipelago; ? Formosa.

Clematis angustifolia Jacquin, Enum. Vindob. 310 (1762).—Bung in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 75 (Enum. Pl. Chin. Bor. 1e (1833).—Turczaninow in Bull. Soc. Nat. Moscou, X. no. VII. 148 (1837).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 468 (Ind. Fl. Pekin.) (1859); Enum. Pl. Mongol. 2 (1889).—Franchet in Mém. Soc. Sci. Nat. Cherbourg, XXIV. 197 (1884); in Nouv. Arch. Mus. Paris, sér. 2, V. 166 (Pl. David. I. 14) (1882).—Hemsley in Jour. Linn. Soc. XXIII. 2 (1886).—Faber in Denkschr. Entwickel. Kiautschou, 31 (1898).—Pritzel in Bot. Jahrb. XXXI. 332 (1900).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 536 (1903); Contrib. Fl. As. Or. I. 21 (1905).—Gilg in Bot. Jahrb. XXXIV. beibl. LXXV. 34 (1904).—Loesener in Beih. Bot. Centralbl. XXXVII. abt. II. 123 (1919).—Cowdry in Jour. N. China Branch R. As. Soc. LIII. 160 (Pl.

Peitaiho) (1922).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 374 (1922).

Clematis angustifolia var. *Tchefouensis* Debeaux in Act. Soc. Linn. Bordeaux, XXXI. 117 (Fl. Tché-foû, 22) (1877).

CHILI: Weichang, *W. Purdom*, no. 44, 1909; near San tun ying, *F. N. Meyer*, no. 986, June 2, 1913; Hsiao wu tai shan, *F. N. Meyer*, no. 1352, August 26, 1913; hills near Peking, *S. W. Williams*, August, 1876 (Gray Herb.); without precise locality, *Père Chanet*, no. 28, 1918.—See also Bunge, l. c., Turczaninow, l. c., Maximowicz, l. c., Franchet, l. c. (Pl. David.), Hemsley, l. c., and Limpricht, l. c.

SHANTUNG: Tsingtau, *R. Zimmermann*, no. 205, 1901; Cape Yatau, near Tei shing kung, *R. Zimmermann*, no. 448.—See also Hemsley, l. c., Debeaux, l. c., Franchet, l. c. (Mém. Cherbourg), Faber, l. c., Gilg, l. c., and Loesener, l. c.

SHENSI: Tai pa shan, *G. Giraldi*, no. 865 (ex Pritzel).

DISTRIBUTION: also Dahuria, Mongolia, Manchuria.

Clematis recta L. var. **mandshurica** Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 218 (1876); in Mél. Biol. IX. 595 (1876).—Hemsley in Jour. Linn. Soc. XXIII. 7 (1886).—Pritzel in Bot. Jahrb. XXIX. 332 (1900).

Clematis mandshurica Ruprecht in Bull. Acad. Sci. St. Pétersb. XV. 258 (1857).—Bailey, Gent. Herb. I. 23 (1920).

CHILI: Trappist Monastery, western hills near Peking, *N. H. Cowdry*, no. 1991, 1921.

HONAN: Chi kung shan, *L. H. Bailey*, 1917 (ex Bailey, l. c.).

SHENSI: Lun san huo, *G. Giraldi*, no. 895 (ex Pritzel, l. c.).

DISTRIBUTION: also Kiangsu, Chekiang; Manchuria, Korea.

Clematis paniculata Thunberg in Trans. Linn. Soc. II. 337 (1794).—Faber in Denkschr. Entwickel. Kiautschou, 31 (1898).—Pritzel in Bot. Jahrb. XXIX. 332 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. I. 330 (1913).

SHANTUNG: see Faber, l. c.

SHENSI: Gniu ju, In kia pu, Tui kio shan and Hua tzo pin, *G. Giraldi*, nos. 876, 882, 883, 884, 885 and 893 (ex Pritzel, l. c.).

DISTRIBUTION: also Kiangsu, Hupeh, Kiangsi, Chekiang; Manchuria, Korea, Japan.

The occurrence of this species in Shantung remains doubtful as Faber cites it with a question mark and no specimens of his are available and it has not been found by any other collector.

Clematis gracilifolia Rehder & Wilson in Sargent, Pl. Wilson. I. 331 (1913).

KANSU: Min chou, alt. 2600 m., *W. Purdom*, no. 1025, 1911; Choni district, alt. 2600–3000 m., *W. Purdom*, no. 1140, 1911.—See also Rehder & Wilson, l. c.

DISTRIBUTION: also Western Szechuan.

Clematis montana Buchanan-Hamilton apud De Candolle, Syst. 1. 164 (1818).—Pritzel in Bot. Jahrb. XXIX. 333 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. 1. 332 (1913).

SHENSI: summit of Si ku tzin shan, *G. Giraldi*, no. 868 (ex Pritzel, l. c.).

DISTRIBUTION: also Hupeh, Szechuan, Yunnan; Himalayas.

Clematis montana var. **pentaphylla** Maximowicz in Act. Hort. Petrop. XI. 10 (1890).

KANSU: Monastery Dshoni, between Mörping and Wuping, and in the valley of the Tao ho near Dsio tsheng, *G. N. Potanin*, 1885 (ex Maximowicz, l. c.).

Among the numerous specimens of *C. montana* in this herbarium I have found only one which agrees in its leaves with var. *pentaphylla* and this is Forrest's no. 10222 from Yunnan which according to its large rosy pink flowers is referable to var. *rubens* Wils.

Clematis acerifolia Maximowicz in Bull. Soc. Nat. Moscou, LIV. 2 (Fl. As. Or. Fragm.) (1879).—Pritzel in Bot. Jahrb. XXIX. 333 (1900).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 524 (1903); Contrib. Fl. As. Or. 1. 9 (1905).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 376 (1922).

CHILI: Po hua shan, *E. Bretschneider* (ex Maximowicz, l. c.), near Peking, *A. Provost*, no. 87, and *E. Bodinier*, 1889 (ex Finet & Gagnepain, l. c.), *W. Limpricht* (ex Limpricht, l. c.).

SHENSI: "In gia pon," *G. Giraldi*, no. 866 (ex Pritzel, l. c.).

Clematis Potanini Maximowicz in Act. Hort. Petrop. XI. 9 (1890).—Pritzel in Bot. Jahrb. XXIX. 333 (1900).

Clematis montana var. *Potaninii* Finet & Gagnepain in Bull. Soc. Bot. France, L. 525 (1903); Contrib. Fl. As. Or. 1. 10 (1905).

SHENSI: In kia po, Tai pa shang and Tue lian pin, *G. Giraldi*, nos. 1668, 867 and 872 (ex Pritzel, l. c.).

KANSU: between Mörping and Wuping, on Itohu-shan, *G. N. Potanin*, 1885 (ex Maximowicz, l. c.).

DISTRIBUTION: also Szechuan.

Finet and Gagnepain consider this species of which I have seen no specimens a variety of *C. montana*, but the description by Maximowicz of the peduncles as bracteated in the middle and 1–3-flowered and of the flower as having 6 sepals does not agree with *C. montana;* possibly Maximowicz's species belongs to *C. Fargesii* Franchet, while the specimens from Batang cited by Finet & Gagnepain may represent *C. montana* var. *pentaphylla* Maxim.

Clematis Fargesii Franchet in Jour. de Bot. VIII. 273 (1894).—Rehder & Wilson in Sargent, Pl. Wilson. 1. 335 (1913).

KANSU: Tow River, alt. 3000 m., *W. Purdom*, no. 1024, 1911 (see also Rehder & Wilson, l. c.).

DISTRIBUTION: also Szechuan.

Clematis Fargesii var. **Souliei** Finet & Gagnepain in Bull. Soc. Bot. France, L. 523 (1903); Contrib. Fl. As. Or. I. 8 (1905).—Rehder & Wilson in Sargent, Pl. Wilson. I. 336 (1913).

Clematis Fargesii Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 376 (1922); vix Franchet sensu stricto.

SHENSI: Tai pei shan, *W. Purdom*, no. 540, 1910.—See also Rehder & Wilson, l. c., and Limpricht, l. c.

DISTRIBUTION: also Szechuan, Yunnan (*G. Forrest*, no. 10354).

Clematis grata Wall. var. **grandidentata** Rehder & Wilson in Sargent, Pl. Wilson. I. 338 (1913).—Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 8 (1922).

Clematis grata Hemsley in Jour. Linn. Soc. XXIII. 3 (1886), pro parte.—Maximowicz in Act. Hort. Petrop. XI. 9 (1890).—Pritzel in Bot. Jahrb. XXIX. 333 (1900).—Non Wallich.

HONAN: Teng feng, Yu tai shan, *J. Hers*, no. 296, June 17, 1919.—See also Hers, l. c.

SHENSI: Tai pei shan, *W. Purdom*, no. 1, 1910.—See also Hemsley, l. c., Maximowicz, l. c., Pritzel, l. c., and Rehder & Wilson, l. c.

DISTRIBUTION: also Kiangsi (*H. H. Hu*, no. 1378), Hupeh, Szechuan, Kweichou (*Handel-Mazzetti*, no. 10308), Yunnan (*Siméon Ten*, no. 432).

Clematis pinnata Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 216 (1876); in Mél. Biol. IX. 591 (1876).

Clematis spec. Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 468 (Ind. Fl. Pekin.) (1859).

CHILI: west of Peking, near the temple Shan-ar across the river Chun che, *A. Tatarinow* (ex Maximowicz, l. c.).

According to Maximowicz's description this plant which has not been recorded by any later author may possibly be referable to *C. grata* var. *lobulata* Rehd. & Wils. Here belongs possibly *C. grata* Limpricht (Bot. Reis. Hochgeb. Chin. Ost-Tib. 376 [1922]) collected on the Hsiao wu tai shan.

Clematis Gouriana Roxburgh apud De Candolle, Syst. I. 138 (1818).—Pritzel in Bot. Jahrb. XXIX. 332 (1900).—Rehder & Wilson in Sargent, Pl. Wilson. I. 339 (1913).—Hers in Jour. N. China Branch R. As. Soc. LIII. 108 (1922); Liste Ess. Lign. Honan, 8 (1922).

HONAN: Hwei hsien, *J. Hers*, no. 715, June 19, 1919; Yung ning, She pa pan, alt. 800 m., *J. Hers*, nos. 848, 849, October 7, 1919; Yung ning, Tsi li ping, alt. 1000 m., *J. Hers*, no. 1351, September 30, 1919; Shih tze miao, alt. 1200 m., *J. Hers*, no. 1295, September 25, 1919.—See also Hers, l. c.

SHENSI: Tai pei shan, *W. Purdom*, no. 4, 1910.—See also Pritzel, l. c., and Rehder & Wilson, l. c.

DISTRIBUTION: also Hupeh, Szechuan, Yunnan, Hunan (*Handel-Mazzetti*, no. 12563), Fokien (*J. B. Norton*, no. 1390); Himalayas, Philippine Islands.

Clematis brevicaudata De Candolle, Syst. I. 138 (1818).—Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 75 (Enum. Pl. Chin. Bor. 1) (1833).—Turczaninow in Bull. Soc. Nat. Moscou, X. no. VII. 148 (1837).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb IX. 468 (Ind. Fl. Pekin.) (1859).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, v. 166 (Pl. David. I. 14) (1882).—Hemsley in Jour. Linn. Soc. XXIII. 3 (1886).—Maximowicz Fl. Tangut. 4 (1889); Enum. Pl. Mongol. 5 (1889) in Act. Hort. Petrop. XI. 8 (1890).—Pritzel in Bot. Jahrb. XXIX. 332 (1900).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 533 (1903); Contrib. Fl. As. Or. I. 18 (1905).—Rehder & Wilson in Sargent, Pl. Wilson. I. 340 (1913).

CHILI: Hsiao wu tai shan, *F. N. Meyer*, no. 1317, August 23, 1913; Shi wen, *F. N. Meyer*, no. 1077, August 3, 1913 (Herb. U. S. Dept. Agric.); Hsiao wu tai shan, Shui shih tao, alt. 1500 m., *J. Hers*, no. 2173, October 8, 1922; Hsiao wu tai shan, southeastern valley, alt. 900–1500 m., *J. Hers*, no. 2207, October 9, 1922; Hills near Great Wall, Kalgan road, *J. G. Jack*, October 5, 1905; Peking, western hills, *J. Hers*, nos. 1580 and 2247, August 7, 1921 and October 14, 1922; Nankow pass, *J. Hers*, no. 1598, August 15, 1921; Peking, *S. W. Williams*, August, 1876, Herb. Hance, no. 12703, and August, 1866 (Gray Herb.); without precise locality, *Père Chanet*, nos. 24 and 98, 1918 and 1919.—See also De Candolle, l. c., Bunge, l. c., Turczaninow, l. c., Maximowicz, l. c. (1859; 1889), Franchet, l. c., and Finet & Gagnepain, l. c.

SHENSI: *P. J. Piasezki* (ex Maximowicz, l. c. [1890] and Hemsley, l. c.); *G. Giraldi* (ex Pritzel, l. c.).

KANSU: *G. N. Potanin* (ex Maximowicz, l. c. [1889; 1890]).

DISTRIBUTION: also Kiangsi, Hupeh, Szechuan, Hunan, (*Handel-Mazzetti*, no. 12508, var. *lissocarpa* Rehd. & Wils.); Manchuria, Korea.

Clematis brevicaudata var. **tenuisepala** Maximowicz in Act. Hort. Petrop. XI. 9 (1890).

KANSU: southern slope of Fyn shan ling, *G. N. Potanin*, 1885 (ex Maximowicz, l. c.).

DISTRIBUTION: also Szechuan.

Clematis aethusifolia Turczaninow in Bull. Soc. Nat. Moscou, v. 181 (1832).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 468 (Ind. Fl. Pekin.) (1859); in Bull. Acad. Sci. St. Pétersb. XXII. 212 (1876); in Mél. Biol. IX. 586 (1876); Fl. Tangut. 3 (1889); Enum. Pl. Mongol. 5 (1889).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, v. 164 (Pl. David. I. 12) (1882).—Hemsley in Jour. Linn. Soc. XXIII. 1 (1886).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 790 (Pl. Enum. 1) (1891);

in Szechenyi, Wiss. Ergeb. Reise Ostas. II. 676 (1898).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 540 (1903); Contrib. Fl. As. Or. I. 25 (1905).

CHILI: Hwai lai, *F. N. Meyer*, no. 1046 (96, 97), July 30, 1913; Nankow, *J. G. Jack*, October 6, 1905; Kalgan, *N. H. Cowdry*, no. 1802, 1921; Shih wen, *F. N. Meyer*, no. 1076, August 3, 1913 (Herb. U. S. Dept. Agric.); Peking, Temple of Heaven grounds, *F. N. Meyer*, no. 189, September, 1905 (Herb. U. S. Dept. Agric.).—See also Turczaninow, l. c., Maximowicz, l. c., Franchet, l. c., and Hemsley, l. c.

SHANSI: Wu chai hsien, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2053, September 7, 1922.

KANSU: Tao chow district, alt. 3300 m., *W. Purdom*, no. 1026, 1911.—See also Maximowicz, l. c. (1889), and Kanitz, l. c.

DISTRIBUTION: also Mongolia, Manchuria (var. *latisecta* Maxim.).

Clematis glauca Willd. var. **angustifolia** Ledebour, Fl. Ross. I. 3 (1842).

Clematis glauca Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 468 (Ind. Fl. Pekin.) (1859); non Willdenow.

Clematis intricata Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. II. 75 (Enum. Pl. Chin. Bor. 1) (1833).—Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 468 (Ind. Fl. Pekin.) (1859).

Clematis orientalis var. *intricata* Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 211 (1876); in Mél. Biol. IX. 583 (1876); Fl. Tangut. 3 (1889); Enum. Pl. Mongol. 4 (1889); in Act. Hort. Petrop. XI. 5 (1890).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, V. 164 (Pl. David. I. 12) (1882).—Hemsley in Jour. Linn. Soc. XXIII. 6 (1886).—Kanitz in Szechenyi, Keletazs. Utján. Tudom. Ered. II. 791 (Pl. Enum. 1) (1891); in Szechenyi, Wiss. Ergeb. Reise Ostas. II. 677 (1898).—Pritzel in Bot. Jahrb. XXIX. 331 (1900).

Clematis orientalis var. *glauca* Maximowicz, Fl. Tangut. 3 (1889).

Clematis orientalis Finet & Gagnepain in Bull. Soc. Bot. France, L. 540 (1903); Contrib. Fl. As. Or. I. 25 (1905), pro parte.—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 376 (1922).—Non Linnaeus.

CHILI: Hwai lai, *F. N. Meyer*, no. 1047, July 30, 1913; Pau au tchon, *F. N. Meyer*, no. 1272, September 3, 1913 (Herb. U. S. Dept. Agric.); Kalgan, *N. H. Cowdry*, no. 1569, 1921; near Nankow, *J. G. Jack*, October, 4 1905; near Peking, *S. W. Williams*, August, 1876 (Gray Herb.); east of Peking, canal embankment, *N. H. Cowdry*, no. 359, October 3, 1919; Altar of Agriculture grounds, *N. H. Cowdry*, no. 360, May 4, 1919.—See also Bunge, l. c., Maximowicz, l. c. (1876, 1890) and l. c. 4 (1889), Franchet, l. c., Limpricht, l. c.

SHANSI: *G. N. Potanin*, 1884 (ex Maximowicz, l. c. [1890]).

SHENSI: *G. Giraldi*, nos. 865, 871, 873, 879, 880 (ex Pritzel, l. c.).—See also Limpricht, l. c.

KANSU: *P. J. Piasezki*, *N. M. Przewalski* and *G. N. Potanin* (ex Maximowicz, l. c. 3 [1889]) and *W. Mesny* (ex Hemsley, l. c.), *P. J. Piasezki* (ex Finet & Gagnepain, l. c.), *L. Loczy* (ex Kanitz, l. c.).

DISTRIBUTION: also Mongolia.

The specimens from Kansu cited by Hemsley and by Finet and Gagnepain may possibly belong to the following variety; Maximowicz does not mention Piasezki's specimens under either of the two varieties.

Clematis glauca var. **akebioides** Rehder & Wilson in Sargent, Pl. Wilson. I. 342 (1913).

Clematis orientalis var. *akebioides* Maximowicz in Act. Hort. Petrop. XI. 6 (1890).

KANSU: Lao chon district, alt. 3000 m., *W. Purdom*, no. 1129, 1911; Tow River, alt. 3000 m., *W. Purdom*, no. 1022, 1911.—See also Maximowicz, l. c., and Rehder & Wilson, l. c.

DISTRIBUTION: also Szechuan.

Some of the specimens, also those cited above, are more or less intermediate between this and the preceding variety, but the extreme forms of both varieties look very distinct. Purdom's two specimens are referable on account of the violet color of their flowers to *C. glauca* var. *akebioides* f. *phaeantha* Rehder (in Jour. Arnold Arb. I. 195 [1920]), based on cultivated specimens raised from seed probably collected in Kansu by Purdom; this form, too, is intermediate between the two varieties.

Clematis Kirilowii Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 210 (1876); in Mél. Biol. IX. 583 (1876).

Clematis Massoniana ? Maximowicz in Mém. Div. Sav. Acad. Sci. St. Pétersb. IX. 468 (Ind. Fl. Pekin.) (1859).

CHILI: near Peking, *Kirilow* (ex Maximowicz, l. c.).

Finet & Gagnepain do not mention this species and I have seen no specimens referable to this species which may be only an abnormal form of *C. glauca.*

Clematis tangutica Korshinsky in Bull. Acad. Sci. St. Pétersb. sér. 5, IX. 399 (1898), excl. descript.—Rehder & Wilson in Sargent, Pl. Wilson. I. 343 (1913).

Clematis orientalis var. *tangutica* Maximowicz, Fl. Tangut, 3 (1889).

KANSU: *P. J. Piasezki* (ex Maximowicz, l. c.).

Piasezki's specimen may belong to the following variety, as it is doubtful, if typical *C. tangutica* occurs in Kansu.

Clematis tangutica André var. **obtusiuscula** Rehder & Wilson in Sargent, Pl. Wilson. I. 343 (1913).

KANSU: Choni and Lao chon, alt. 3000 m., *W. Purdom*, no. 1023, 1911.—See also Rehder & Wilson, l. c.

DISTRIBUTION: also Szechuan.

Clematis alpina Miller, Dict. Gard. ed. 8, no. 9 (1768).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, v. 166 (Pl. David. I. 14) (1882).—Hemsley in Jour. Linn. Soc. XXIII. 1 (1886).—Pritzel in Bot. Jahrb. XXIX. 333 (1900).—Finet & Gagnepain in Bull. Soc. Bot. France, L. 551 (1903); Contrib. Fl. As. Or. I. 36 (1905).—Limpricht, Bot. Reis. Hochgeb. Chin. Ost-Tib. 373 (1922).

Clematis alpina var. *chinensis* Maximowicz in Act. Hort. Petrop. XI. 10 (1890).

CHILI: Hsiao wu tai shan, alt. 2000–2600 m., *F. N. Meyer*, no. 1316, August 23, 1913; without precise locality, *Père Chanet*, nos. 41, 46, and 95, 1918 and 1919.—See also Franchet, l. c., Hemsley, l. c., Pritzel, l. c., Finet & Gagnepain, l. c., and Limpricht, l. c.

SHANSI: Wu chai hsien, Ta nan kow, alt. 2000–3000 m., *Tchuang Kieh*, Hers no. 2027, September 7, 1922.—See also Maximowicz, l. c., and Pritzel, l. c.

DISTRIBUTION: also Europe through northern Asia to Manchuria and Japan.

As most of the specimens before me are in fruit I am not able to distinguish between the type and var. *chinensis* Maxim.

Clematis macropetala Ledebour, Icon. Pl. Fl. Ross. 5, tab. 11 (1829).—Hance in Jour. Bot. XIII. 130 (1875).—Hemsley in Jour. Linn. Soc. XXIII. 5 (1886).—Diels in Bot. Jahrb. XXXVI. beibl. LXXXII. 40 (1905).

Atragene macropetala Ledebour, Fl. Alt. II. 367 (1830).—Maximowicz in Bull. Acad. Sci. St. Pétersb. XXII. 224 (1876); in Mél. Biol. IX. 603 (1876).

Clematis alpina var. *macropetala* Maximowicz, Enum. Pl. Mongol. 6 (1889); in Act. Hort. Petrop. XI. 10 (1890).—Finet & Gagnepain in Jour. Soc. Bot. France, L. 552 (1903); Contrib. Fl. As. Or. I. 37 (1905).

CHILI: without precise locality, *Père Chanet*, no. 6, 1918.—See also Hance, l. c., Maximowicz, l. c. (1876; 1889), Hemsley, l. c., and Finet & Gagnepain.

SHANSI: Wu tai shan, *G. N. Potanin* (ex Maximowicz, l. c. [1890]).

SHENSI: Tai pei shan, *G. Giraldi*, July, 1897; same locality alt. 2600–3000 m., *W. Purdom*, no. 417, 1910.—See also Diels, l. c.

KANSU: Min chou, alt. 2600–3000 m., *W. Purdom*, no. 417[a], 1911.—See also Maximowicz, l. c. (1889).

DISTRIBUTION: also Dahuria, Mongolia, Manchuria.

Maximowicz (l. c. [1889]) distinguishes of *C. alpina* var. *macropetala* two subvarieties: subvar. *rupetris* collected in Chili, and subvar. *albiflora* collected in Kansu.

(*To be continued*)

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NOTES ON HYBRID BERBERIS AND SOME OTHER GARDEN FORMS

CAMILLO SCHNEIDER

During my stay at the Arnold Arboretum from 1915 to 1919 I had the opportunity to study some forms of Berberis most of which have been in cultivation for a long time, and are, apparently, of hybrid origin. I have taken a keen interest in these forms since I published in 1906 my remarks on the Berberis of Schrader's Herbarium preserved at St. Petersburg (see Mitt. Deutsch. Dendrol. Ges. XIV. 111–124). In 1838, Schrader described in vol. XII of Linnaea a number of Berberis species mostly from plants cultivated in European gardens. Some of his forms are very doubtful, and I have not been able to elucidate them. Besides the forms already mentioned by Schrader I have found many more in the great collections in Europe and America; and I wish today to draw attention at least to some of these. Unfortunately I have not been able to finish my studies on all the cultivated forms of Berberis, but some of these which I am going to describe are of no small value as garden plants.

× **Berberis emarginata** Willdenow, Enum. Pl. Hort. Bot. Berol. 395 (1809); Berl. Baumz. ed. 2, 53 (1811).—Guimpel, Otto und Hayne, Abb. Fremd. Holzart. 78, t. 68 (1819-1825).—Schneider in Mitt. Deutsch. Dendr. Ges. XV. 178 (1907).

B. emarginata var. *latifolia* Tausch in Flora XXI. 799 (1838).
B. dentata Tausch, l. c. (1838), incl. var. *latifolia* et var. *capitata*.
B. vulgaris var. *emarginata* Gordon in Gard. Mag. n. s. VI. 2 (1840).
B. vulgaris var. *microphylla* Regel in Act. Hort. Petrop. II. 414 (1873).

Frutex erectus, dense ramosus, habitu *B. sibiricae*, 0.4–0.8(–1.2) m. altus; ramuli annotini flavescentes, sed plerique rubescentes vel purpurascentes, laeves, ut biennes flavo-cinerei angulato-sulcati, vetustiores cinerascentes; internodia 1–2 cm. longa; spinae satis debiles, pleraeque 3-fidae, interdum simplices vel 5–7-fidae, flavescentes, mediae ad 12 mm. longae, subtus sulcatae. Folia 4–7-fasciculata, inaequalia, matura membranacea, ramulorum fertilium obovato-oblonga vel obovato-lanceolata, apice acuta vel obtusa, mucronulata, basim versus in petiolum subnullum vel brevem sensim attenuata, margine dentibus gracilibus 0.5–1 mm.

longis utrinque circiter 6–12 serrulata, 1.3–4 cm. longa et 0.5–1.5 cm. lata, superne saturate viridia, subtus pallidiora, pruinosa, margines cellularum epidermidis utriusque faciei undulatae (subtus distinctius); folia ramulos novellos fulcientia surculorumque saepius majora, ovato- vel obovato-elliptica, minus dense sed interdum grossius serrata, ad 4 : 2.1 cm. magna vel versus apicem surculorum minora sed satis latiora circiter 2 : 1.8 cm. magna, subintegra. Inflorescentiae pleraeque breviter racemosae, apicem ramulorum versus fasciculato-racemosae, densiflorae, circiter 5–16-florae, 1–3 cm. longae, nutantes; pedicelli 5–8 mm. longi, graciles, apice leviter incrassatae bracteis lanceolatis acuminatis 2–3 mm. longis suffulti; flores lutei, 8–10 mm. diametientes; sepala externa vel prophylla bracteiformia, media ovato-oblonga vel elliptica, interna iis $\frac{1}{3}$ majora, latiora, obovato-elliptica, 5–5.5 mm. longa; petala obovato-oblonga, 4.5–5 mm. longa, apice distincte inciso-emarginata, basi subunguiculata, glandulis 2 irregulariter ovoideis satis magnis paullo distantibus aurantiacis praedita; stamina petalis $\frac{1}{3}$ breviora, subapiculata; ovarium ellipticum, stigmate lato, ovulis ut videtur saepissime 3, interdum 2 vel 4 subsessilibus. Fructus maturi elliptici, circiter 9–11 mm. longi, 4.5–6 mm. crassi, stylo brevissimo vel indistincto excluso, saturate coccinei, leviter pruinosi; semen plerumque 1, circ. 7 mm. longum, purpureo-brunneum, minutissime punctulatum.

Of this form I have seen the author's type preserved at Berlin. Willdenow states that it came from "Siberia" but there is no wild species or variety known from Asia that agrees with it. In 1811, Willdenow himself says: "Ein drei bis vier Fuss hoher Strauch, der beim ersten Anblick der vorhergehenden Art (*B. vulgaris*) ähnlich zu sein scheint, aber in der Blattform und im feineren Ansehn der sibirischen Berberitze viel näher verwandt ist." Therefore Willdenow himself indicates that *B. emarginata* is intermediate between *B. vulgaris* and *B. sibirica*, and there can not be the least doubt that it is a hybrid between these two species. The form described by me is almost identical with the one figured by Guimpel. In the Arnold Arboretum I saw plants that came from Highland Park at Rochester, N. Y., under no. 16 as *B. sibirica* which approach more nearly *B. vulgaris*.

K. Koch, Dendr. 1. 398 (1869), declares that *B. emarginata* is "Ohne Zweifel" a cross between *B. canadensis* and *B. sibirica*, but no trace of the first species can be detected in any plant of *B. emarginata* which I have seen. Regel says of his *B. vulgaris* var. *microphylla*: "Videtur forma hybrida hortensis inter *B. vulgarem* et *B. sibiricam*." The real *B. emarginata* he confuses with some oriental forms of very different relationship.

Being a hybrid, somewhat different forms of *B. emarginata* may be met with in gardens but there seems no need to give them varietal names. I wish, however, to call attention to the following form which looks like a distinct variety or may have had its origin in a cross of *B. emarginata* with a form of *B. amurensis*.

Berberis emarginata var. **britzensis**, var. nov.

Frutex ramosus, vix ad 1 m. altus; ramuli annotini leviter brunnescentes vel cinereo-brunnei, valde sulcati, biennes cinerascentes, vetustiores cinereo-nigrescentes; internodia 1.5–2 cm. longa; spinae 3-fidae, brunnescentes vel flavescentes, subtus sulcatae, mediae 0.5–2 cm. longae, lateralibus longiores. Folia ad 8-fasciculata, inaequalia, matura crasse papyracea, ramulorum fertilium oblanceolata vel anguste elliptica, apice acuta, basi sensim in petiolum ad 5 mm. longum attenuata, margine densissime graciliter serrulata serraturis 0.5–1 mm. longis circiter 4–5 pro 5 mm., minimis exceptis 2.5–4 cm. longa et 0.7–1.3 cm. lata, superne saturate viridia, indistincte reticulata, subtus laete viridia, paullo discoloria, distincte anguste elevato-reticulata (margines cellularum epidermidis utriusque faciei aequimagnarum subrectae vel paullo undulatae); folia ramulos novellos fulcientia aliis similibus sed ad 5 : 1.5 cm. magnis interdum grossius serrulata, surculorum elliptica vel ovato-elliptica, distantius et saepe longius ad 4.5 : 1.8 cm. magna, subtus pruinosa. Inflorescentiae racemosae, ad 4 cm. longae, subdensae, pendentes; pedicelli 8 (infimi) vel 5–6 mm. longi, bracteis lanceolatis acutis ad 2 mm. longis suffulti; flores aperti circiter 7 mm. diametientes, ?lutei; sepala externa (prophylliformia) minima, late triangularia, mediis late ovatis duplo minora, interna ovato- vel obovato-elliptica, circiter 4.5 mm. longa; petala oblongo-elliptica, circiter 5 mm. longa, apice emarginata, basi haud vel paullo unguiculata, glandulis 2 aurantiacis mediocribus oblongis separatis praedita; stamina petalis ⅓ breviora, apice truncata; ovarium ovato-ellipticum, stigmate satis lato, ovulis 2–3 sessilibus instructum. Fructus ut videtur coccinei, leviter pruinosi, elliptici vel obovato-elliptici, circiter 9 : 4 mm. magni, estylares; semen 1, purpureum, levissime punctulatum.

This form has been distributed by L. Späth of Berlin under the name of *B. cretica* according to a specimen from Highland Park, Rochester, N. Y. (no. 26, June 5 and October 15, 1907). It is very similar to *B. emarginata* and conspicuous by its densely and finely serrate leaves. It has not been possible to trace its origin, and it needs further observation.

Berberis provincialis Audibert apud Schrader in Linnaea XII. 381 (1838).—Schneider in Mitt. Deutsch. Dendr. Ges. XV. 181 (1907).

Berberis vulgaris var. *provincialis* Audibert, Cat. 1831/2, pt. 2, p. 6, nom. nud.

Frutex ut videtur dense ramosus, altitudine incerta (ex cl. Schrader probabiliter "5–6 ped."); internodia circiter 1.5 mm. longa; spinae 1–3-partitae, graciles, flavo-brunnescentes, mediae subtus sulcatae, ad 1 cm. longae vel surculorum longiora. Folia 3–6-fasciculata, inaequalia, matura chartacea, ramulorum fertilium anguste oblonga vel ovato-oblonga, apice obtusa vel subacuta, basi in petiolum brevem attenuata, margine graciliter setoso-serrulata dentibus utrinque circiter 6–12 infimis ad 1.5 mm. longis, superne intense viridia, nitida, subtus laete viridia discoloria,

utrinque laxe reticulata, 1.5–2 cm. longa et 7–9 mm. lata vel ad 2.5 cm. longa et ad 1.2 cm. lata; folia ramulos novellos fulcientia ultra 3 cm. longa, ovato- vel obovato-oblonga, in petiolum longiorem attenuata, surculorum elliptica vel ovato-elliptica, basi cuneata breviter petiolata, ad 4.5 cm. longa et ad 2.3 cm. lata, grossius serrulata, subtus glaucescentia. Inflorescentiae breviter racemosae vel fasciculato- (vel subumbellato-) racemosae, rarius elongatae et nutantes, 1–3 cm. longae; flores aperti nondum visi. Fructus elliptici, coccinei, circ. 8–9 : 5 mm. magni, fere semper estylares.

According to Schrader, whose type I have seen, he received this form from Audibert at Tarascon and also as *B. ilicifolia* from the Botanical Garden at Vienna. I have seen a "catalogue des Pepinières des Frères Audibert à Tonelle, près de Tarascon" of the year 1831/2. Here a *Berberis vulgaris* v. *provincialis* "de provence" is mentioned. This seems to point to a wild form of *B. vulgaris* from the southwestern parts of France, but I have not found in books any mention of a wild form agreeing with Schrader's description. In a note he says: "*B. provinc.* forte ad prim. sect. refer. cum ramis minus rubris et flor. cum *vulgari*." I am, however, not sure whether the form from Vienna and that from Tarascon really were of the same origin. As I stated in 1906 the form preserved in Schrader's Herbarium is very similar to the form described by Koehne as *B. serrata*, and there is a reasonable chance that both are of the same origin. The true *B. serrata* is a very distinct form recognized at the first glance from *B. provincialis* by its very acute leaves. In the Arnold Arboretum, however, I found, under no. 5886-1, plants raised from typical *B. serrata* (no. 18 ex Rochester) that show a closer similarity to *B. provincialis* than to typical *B. serrata* (as represented by Herb. Dendr. Koehne no. 463). I therefore feel justified in regarding *B. serrata* as a mere variety of what I consider according to Schrader *B. provincialis*. It would be interesting to raise from seeds several generations of this hybrid in order to trace its real parents. One of them is doubtless *B. vulgaris*. The presence sometimes of three ovules, the character of the inflorescence, the shape of the petals, the appearance of the leaves and spines and the color of the twigs indicate *B. sibirica* as the second parent, but the typical *B. emarginata* has larger flowers and inflorescences. After all, *B. provincialis* may be of very similar origin as *B. emarginata*.

Berberis provincialis var. **serrata**, nov. var.

B. serrata Koehne, Deutsche Dendr. 170 (1893).

B. microphylla var. *serrata* Hort. Kew, in a MSS-list of 1884.

Frutex ex auctore 0.6 m. altus, ramis erectis squarrosis; ramuli annotini flavo-rubri vel satis rubescentes, distincte sulcati, laeves, etiam biennes cinereo-brunnei, vetustiores nigrescentes; internodia 1–1.5 cm. longa; spinae graciles, 1–3-fidae, flavescentes, vel rubescentes, mediae ad 10 mm. longae, subtus sulcatae. Folia 4–8-fasciculata, inaequalia, matura chartacea,

ramulorum fertilium lanceolata vel oblanceolata, apice acuta, basim versus in petiolum brevem attenuata, satis argute graciliter serrata dentibus 0.5–1.5 mm. longis utrinque 6–10(–12), superne vivide viridia, nitida, subtus vix vel paullo pallidiora, utrinque laxe elevato-reticulata, minimis exceptis 1–2(–2.3) cm. longa et 3–6 mm. lata; folia ramulos novellos fulcientia surculorumque late lanceolata, grossius serrulata (serraturis ad 3 mm. longis), ad 3.3 cm. longa et 1 cm. (dentibus exceptis) lata, subtus saepe distincte glaucescentia. Inflorescentiae pleraeque dictincte breviter racemosae vel saltem versus apicem ramulorum fasciculato-racemosae, circiter 6–15-florae, ad 3 cm. longae; pedicelli graciles, 5–8 (infimi ad 10) mm. longi, bracteis lanceolatis acuminatis 2–3 mm. longis suffulti; flores aurei, circiter 6 mm. diametientes; sepala externa (prophylliformia) parva triangularia vel ovata, media obovato-oblonga, illis duplo majora, interna mediis similia circiter ¼ longiora, 5 mm. longa; petala 5–6 mm. longa, obovato-oblonga, apice inciso-emarginata, basi leviter attenuata, glandulis 2 ellipticis distinctis separatis aurantiacis praedita; stamina petalis ⅓ breviora, apice fere truncata; ovarium ellipticum, stigmate lato crasso sessili, ovulis 2–3 subsessilibus. Fructus elliptici, coccinei, circ. 7 : 4 mm. magni, estylares; semina 1–2, cinnamomea, levissime punctata, circiter 5 mm. longa.

Koehne in 1893 apparently described his species from plants in the Botanical Garden at Berlin called *B. microphylla serrata*. In the Kew Garden List mentioned above this form is said to have been received from R. McCleland, and the remark is added: "is *B. serratifolia*, Poir. Habitat unknown." Poiret, however, never described such a species; in 1808 he only mentions under *B. cretica*: "Eadem, foliis dentato-ciliatis, ovatis, obtusis." This form De Candolle in 1821 refers to as "*B. cretica*, serratifolia foliis serrato-ciliatis, Poir. l. c." Not having seen the specimens of Poiret or De Candolle I cannot elucidate their forms. They may belong to *B. nitens* which apparently is a cross of *B. cretica*. In *B. provincialis* and its var. *serrata*, however, the stomata in the upper surface of the leaves so characteristic of those of *B. cretica* are entirely absent.

Like *B. emarginata*, *B. provincialis*, especially its variety *serrata* are handsome shrubs densely covered with golden flowers in May. Both are well worth wide distribution in gardens.

Berberis kewensis, n. sp. vel hybr.

Frutex ramis elongatis habitu probabiliter *B. aristatae;* ramuli annotini purpureo-brunnescentes, leviter angulato-sulcati, laeves, biennes cinerascentes vel sordide cinereo-brunnei, vetustiores cinerei; internodia 1.5–2.5(–3) cm. longa; spinae 3-fidae, rarius simplices, flavescentes, divaricatae, mediocres vel satis validae, mediae 0.6–2.2 cm. longae, lateralibus saepissime longiores.

Folia 4–8-fasciculata, inaequalia, matura satis crasse chartacea, ramulorum fertilium anguste elliptica, vel ovato-elliptica, apice obtusa vel brevi-acuta, mucronulata, basi subsensim in petiolum ad 5 mm. longum contracta, margine graciliter spinoso-serrata dentibus brevibus circiter 1–1.5 mm. longis utrinque 5–10 vel subintegerrima, superne intense viridia, subtus discoloria, pruinosa, utraque pagina laxe elevato-reticulata (margine cellularum epidermidis faciei superioris subrectae inferioris distincte undulatae), minimis exceptis 2.5–5 cm. longa, 0.9–2 cm. lata, ramulos novellos fulcientia majora, grossius spinoso-serrata, ad 5.5 : 1.5 cm. magna, late elliptica, interdum longius petiolata, surculorum late ovato- vel obovato-elliptica, obtusiora, ad 5 : 3 cm. magna, subtus distinctius albescentia, grossius subsinuato-serrata, vel satis parva, late elliptica et integerrima. Inflorescentiae distincte elongato-racemosae, pedicellis saepissime a basi incipientibus, interdum basi nudae sed saepe ima basi floribus singulis longius pedicellatis additis, nutantes pendentesve, circiter 15–20-florae, 4–8 cm. longae, iis *B. aristatae* valde similes; pedicelli fructiferi satis crassi, plerique rubescentes, 5–10 (infimis longioribus exceptis) cm. longi, apice satis incrassati, bracteis ovato-triangularibus acutis vel acuminatis 2–2.5 mm. longis suffulti; flores ut videtur aurei, aperti circiter 10 mm. diametientes; sepala externa bracteiformia, parva, media late ovata, internis late obovatis basi contractis circiter 6 mm. longis duplo minora; petala sepalis internis similia, interdum ad 6.5 mm. longa, apice integra vel levissime emarginata, basi contracta, glandulis 2 aurantiacis mediocribus breviter ovato-oblongis praedita; stamina petalis ⅓–¼ breviora, apice vix apiculata; ovarium ellipticum stylo brevi, stigmate mediocri coronatum, ovulis 2–3 subsessilibus instructum. Fructus 10–12 : 5–6 mm. magni stylo brevi distincto excluso, atroviolacei, pruinosi; semina 1–2, cinnamomea, levissime punctulata, circiter 7–7.5 mm. longa.

This interesting plant I have not yet been able to study in a living state. It came to the Arnold Arboretum from Kew under the name of *B. Lycium* and flowered in the Arboretum in May, 1900. Fruits also were collected there by A. Rehder in September, 1900 and November 1, 1902 (no. 1781–5, olim 3243). In the Arboretum it received the name *B. aristata*, and the leaves, flowers, and fruits do, indeed, much resemble those of that species and nothing points to *B. Lycium* Royle. The angulate and distinctly purple or purple-brown branchlets which are brownish-gray even in the second year make it impossible to regard this form as a mere variety of *B. aristata* DC. It may possibly be a distinct species raised at Kew from East Indian seeds, and of all the species known to me from the Himalayas it comes nearest to *B. Huegeliana* Schneid., the type of which has yellow-brown twigs and is not yet in cultivation. Of *B. chitria* Hamilt., which was introduced at least a hundred years ago, I cannot detect any influence upon *B. kewensis*. No specimen which I have seen shows a trace of a paniculate inflorescence. I do not know whether this well marked form is still in cultivation.

Berberis hauniensis, nov. spec. vel hybr.

Frutex ut videtur satis dense subelongato-ramosus; ramuli annotini, flavo-rubri vel ut biennes sordide rubro-brunnei, distincte angulato-sulcati, lenticellosi sed satis laeves, vetustiores nigro-cinerascentes; internodia 1–2 cm. longa; spinae simplices, patentes, brunnescentes, 1–2 cm. longae, subtus sulcatae vel 3-fidae et laterales mediis breviores.

Folia ad 8-fasciculata, inaequalia, matura tenuiter chartacea vel chartacea, ramulorum fertilium obovato-oblonga vel anguste oblonga, apice fere semper obtusa vel rotundata, basim versus subito in petiolum ad 5 mm. longum attenuata, margine integerrima vel satis minute serrulata, dentibus gracilibus utrinque 4–5 vix 1 mm. longis, superne intense viridia, subtus discoloria et pruinosa, utraque pagina laxe tenuiter elevato-reticulata (margines cellularum epidermidis utriusque faciei aequimagnarum rectae vel subrectae), minimis exceptis 2–4 cm. longa et 0.9–1.7 cm. lata; folia ramulos novellos fulcientia saepe oblongiora, acutiora, grossius serrata, ad 5.5 : 2 cm. magna petiolis ad 1 cm. longis inclusis, surculorum majora, obovato-oblonga vel obovato-elliptica, saepissime densius breviserrata, ad 6 : 2.5 cm. petiolis inclusis magna. Inflorescentiae inferiores distincte paniculato-racemosae, superiores racemosae, omnes densiflorae, 10–20-florae, nutantes, 2–3.5 cm. longae, rubescentes, axis satis tenuibus; pedicelli graciles 4–6 mm. longi basi bracteis anguste lanceolatis acuminatis 2–3 mm. longis suffulti; flores ut videtur aurei et extus paullo rubescentes, aperti circiter 8 mm. diametientes; sepala externa triangulari-lanceolata, mediis elliptico-oblongis minora, interna circiter 5 mm. longa, obovata; petala circiter 6 mm. longa, satis anguste elliptica, apice distincte inciso-emarginata, basi vix contracta, glandulis 2 distantibus aurantiacis satis parvis oblongis separatis praedita; stamina petalis fere duplo breviora, apice vix vel brevissime apiculata; ovarium elliptico-oblongum stylo nullo vel indistincto, stigmate mediocri, ovulis 2(–1) subsessilibus. Fructus ut videtur elliptici, ? cerasini, circiter 10 mm. longi et 5 mm. crassi, estylares vel stylo brevissimo coronati; semen fere semper 1, cinnamomeum, levissime punctulatum, circiter 6 mm. longum.

This is another striking form of very uncertain origin. I received from the Botanical Garden at Copenhagen flowering specimens of June 10th and fruiting specimens of October, 1916, under the name *B. cretica.* The lower parts of the dense inflorescence is distinctly paniculate and, so far as the inflorescence is racemose, it resembles that of *B. emarginata* Willd. The texture and dentation of the leaves is not unlike those of *B. aristata* DC. The fruit sometimes shows a short distinct style but I have never found more than two ovules. The somewhat paniculate inflorescence seems to indicate an influence of *B. chitria* Hamilt., while the structure of the flowers in some respect is similar to that of *B. emarginata* or *B. provincialis.* The spines resemble those of *B. aristata* or *B. chitria.* The bracts are relatively long and acuminate as in *B. chinensis* Poir. There are no stomata on the upper surface of the leaves, and nothing indicates that *B. cretica* may be one of the parents.

Berberis macracantha Schrader in Linnaea, XII. 356 (1838).—Schneider in Mitt. Deutsch. Dendr. Ges. XV. 176 (1907).

Frutex divaricato-ramosus, squarrosus, ad 3–4 m. altus, ramis satis crassis elongatis; ramuli annotini flavo-cinerei vel interdum leviter brunnescentes vel hornotini ex parte violascentes, teretiusculi vel angulato-sulcati, laeves, biennes vetustioresque cinerascentes; internodia 1.5–3 cm. longa; spinae 1–3-fidae, ramorum vetustiorum debiles minores, ceterum satis validae, applanatae, subtus sulcatae, flavo-brunnescentes, mediae ad 3 cm. longae, lateralibus longiores. Folia ad 8-fasciculata, inaequalia, matura chartacea vel satis crassa, ramulorum fertilium ovalia vel obovato-elliptica, apice obtusa vel rotundata, rarius acuta, mucronulata, basi satis subito vel sensim in petiolum subnullum vel fere ad 1 cm. longum contracta, superne intense viridia, subtus laete viridia vel cinerascentia et pruinosa, utroque latere pleraque laxe modo *B. aristatae* elevato-reticulata, rarius nervatione ad *B. vulgarem* magis accedentia, margine remote spinuloso-serrulata, dentibus 0.5–1 mm. longis patentibus utrinque 5–15 (margines cellularum epidermidis faciei superioris semper rectae visae, inferioris interdum ab illis non diversae sed saepe satis distincte undulata), minimis exceptis 2.5 : 1 ad 4.5 : 2 cm. petiolis inclusis magna; folia ramulos novellos fulcientia satis anguste obovato-oblonga, ad 6.5 : 2 cm. magna petiolis ad 1.5 cm. longis inclusis, surculorum iis similia vel apicem versus minora, elliptico-rhomboidea, acuta, integerrima. Inflorescentiae elongato-racemosae, satis laxiflorae, inferne nudae vel pedicellis basim incipientibus, nutantes vel pendentes, (8–)10–25-florae, fructiferae ad 7–10 cm. longae; pedicelli interdum ex parte subverticillati, 5–10 mm. longi, infimi saepe longiores, fructiferae graciles vel subcrassae, apice incrassatae, bracteis lanceolatis acuminatis 1.5–2.5 mm. longis suffulti; flores lutei, extus saepe rubescentes, aperti 7–10 mm. diametientes; sepala externa prophylliformia triangularia acuta parva, media illis duplo majora, late ovata vel ovato-elliptica, interna similia vel obovata 6 mm. longa; petala obovato-elliptica, apice integra vel leviter emarginata, basi paullo attenuata, glandulis 2 distinctis separatis aurantiacis oblongo-ellipticis praedita; stamina petalis ½–¼ breviora, apice levissime apiculata vel subtruncata; ovarium ovato-ellipticum, stylo brevi, stigmate mediocri, ovulis 2–4(–5) instructum. Fructus elliptici vel ovato-elliptici, purpureo-violacei (cerasini) vel sanguinei, subpruinosi, 8–10 : 5–6 mm. magni, stylo satis brevi coronati vel estylares; semina 1–2, purpureo-brunnea, levissime punctulata, 5–5.5 mm. longa.

With regard to the origin of this plant Schrader says: "*Berberis macracantha* (*pennsylvanica*) B. ex America 1830." This seems to be the reason for regarding this form as a presumable cross between *B. canadensis* (*caroliniana*) and *B. aristata*. I cannot accept this view of its origin. It looks to me more like a hybrid of *B. vulgaris* with *B. aristata*. I have found it also under the name *B. Fischeri*. This name is first mentioned by Koch in Wochenschr. Ver. Bef. Gartenb. Preuss. Staat. IV. (1861),

p. 94 as a purple-leaved form of *B. canadensis*. *B. Fischeri* of Kirchner, Arb. Musc. 135 (1864) came from the nurseries of F. Booth & Sons at Flottbeck, and seems to be the same as plants I have had before me which well agreed with *B. macracantha*. Kirchner says, "ein ausgebreiteter Strauch mit rutenförmigen Zweigen," a description fitting at least one form of our hybrid. Of the same origin seems to be the following variety which I wish to propose.

Berberis macracantha var. **pulchra**, nov. var. (vel probab. planta hybrida origine diversa).

Frutex ut videtur satis tenuiter elongato-ramosus; ramuli annotini flavescentes vel sordide cinereo-brunnescentes, rarius distinctius saturate brunnescentes, paullo vel versus apicem distinctius angulati, biennes cinerascentes, teretiusculi, vetustiores cinerei; internodia 2–3.5 cm. longa; spinae pleraeque 3-fidae, divaricatae vel versus apicem ramulorum simplices, flavo-brunneae, teretiusculae, subtus sulcatae, mediae 0.5–2 cm. longae, lateralibus longiores. Folia ad 8-fasciculata, inaequalia, matura chartacea, satis crassa, ramulorum fertilium oblanceolata vel anguste obovato-lanceolata vel subspathulata, apice obtusa vel breviter acuta, mucronulata, basi sensim in petiolum subnullum vel ad 5 mm. longum attenuata, margine basi excepta distincte sed graciliter spinuloso-serrata dentibus patentibus 0.5–1 mm. longis utrinque circiter 8–15, superne saturate viridia, subtus pleraque laete viridia, utraque facie satis anguste elevato-reticulata (cellularum margines epidermidis faciei superioris levissime undulatae, inferioris distincte undulatae), minimis exceptis 2 : 0.8 ad 4.5 : 1.6 cm. magna; folia ramulos novellos fulcientia majoribus ramulorum fertilium similia, sed ad 5.5 : 1.8 cm. magna petiolo longiore incluso, surculorum latiora, ovato-elliptica, grossius remote et interdum subsinuato-serrata, apice obtusiora, basi subito in petiolum ad 8 mm. longum contracta, ad 5 : 2.5 cm. magna, subtus fere semper distincte pruinosa, laxius reticulata. Inflorescentiae elongato-racemosae, pedunculo ad 2.5 cm. longo incluso ad 4 cm. longae, 5–8-florae, cum ramulis pendentes, rubescentes; pedicelli interdum versus apicem pedunculi subverticillatim aggregati, 5–7 mm. longi, bracteis anguste lanceolatis acuminatis ad 3 mm. longis suffulti; fructiferi apice leviter incrassati; flores ut videtur aurei, aperti circiter 9–10 mm. diametientes; sepala externa prophylliformia anguste triangularia mediis obovato-ellipticis duplo minora, interna late obovata, mediis fere duplo longiora, ad 7 mm. longa; petala 6.5–7 mm. longa, late elliptica, apice rotundata, integra, basi paullo contracta, glandulis 2 ovoideis distinctis aurantiacis separatis praedita; stamina petalis ⅓ breviora, apice truncata vel vix leviter apiculata; ovarium ovatum stylo distincto, stigmate mediocri, ovulis plerisque 3 subsessilibus. Fructus elliptici ut videtur cerasini et pruinosi, 10–11 : 5–6 mm. magni, stylo distincto ad 0.5 mm. longo excluso; semen plerumque 1, purpurascens, fere laeve.

This form came to the Arnold Arboretum in 1892 from Kew Gardens. It flowered at the Arboretum on May 29, 1898, and fruits were collected by A. Rehder on September 27 of the same year as well as on November 5, 1902 (no. 1781–4, olim 2766). The specimen of September 27, 1898, has rather dark brown young twigs which make it unlikely that it has the same origin as *B. macracantha*. There should be made artificial crosses of *B. aristata* with *B. sibirica* and with *B. canadensis*. We need some experimental proofs, and it may be that certain characters of hybrids are not to be found in either parent as according to Rehder seems to be the case in some Philadelphus-hybrids.

× **Berberis Parsonsii,** hybr. nov.

Frutex ut videtur laxe elongato-ramosus; ramuli annotini flavo-rubri vel fere rubro-purpurascentes, angulato-striati, laeves, biennes cinereo-brunnei, vetustiores cinerascentes; internodia 2–3.5 cm. longa; spinae satis validae, pleraeque 3-fidae, patentes, flavo-brunneae vel flavae, subtus applanatae vel subsulcatae, mediae ad 2.7 cm. longae, lateralibus longiores. Folia ad 7-fasciculata, inaequalia, matura satis crasse chartacea, ramulorum fertilium obovato-oblonga vel -elliptica, apice brevi-acuta vel obtusa, mucronulata, basi cuneata, in petiolum subnullum attenuata, 2 : 0.9 ad 4 : 1.6 cm. magna, margine subintegerrima vel spinuloso-dentata dentibus utrinque 2–6 patentibus 1–3 mm. longis, superne saturate viridia, subtus valde discoloria, albescentia vel glaucescentia, pruinosa et sub microscopio paullo papillosa, utraque pagina valde laxe elevato-reticulata, ramulos novellos fulcientia vel surculorum aliis similia, saepe elliptica acutiora. Inflorescentiae elongatae, valde laxiflorae, 5–7 cm. longae pedunculo 2–3.5 cm. longo incluso, racemosae vel subumbellato-racemosae et saepe ex parte paniculatae, rubescentes, patentes (vel pendulae vel ramis pendentibus?; pedicelli (1–)1.5–2 cm. longi, fructiferi apice leviter incrassati bracteis lanceolatis acuminatis 2.5–3 mm. longis suffulti; flores satis magni, aperti, ut videtur 12–13 mm. diametientes, aurei?, an extus rubicundi?; sepala externa late ovato-triangularia, mediis similibus vel late ovatis fere duplo minora, interna late elliptica vel obovata, 6–7 mm. longa; petala late obovata, circiter 7 mm. longa, apice emarginata, basim versus contracta, glandulis 2 distinctis sed parvis ovoideis separatis aurantiacis? praedita; stamina petalis ⅓ breviora, apice truncata; ovarium elliptico-oblongum, stylo satis distincto, stigmate mediocri, ovulis 3–4 sessilibus. Fructus obovato-oblongi vel -elliptici, cerasini?, leviter, pruinosi, ad 14 : 5–6 mm. magni, stylo distincto circiter 1 mm. longo excluso; semina perfecte matura nondum visa.

This is a remarkable plant which came to the Arboretum in 1884 from the nursery of S. B. Parsons & Sons, Flushing, N. Y., as *B. umbellata*. It flowered on June 21, 1888, and fruits were collected on October 11, 1888 and October 9, 1889 (no. 2173 2, olim 1556). Unfortunately the plant died, and Parsons' nursery no longer exists. I am inclined to believe that

this Berberis is a cross between *B. chitria* and *B. Lycium*. To *B. chitria* point the brownish twigs, the large hardly papillose leaves, the partly paniculate inflorescence, and the long fruits, while the stiff inflorescence with the long pedicels, the distinctly pruinose and somewhat papillose leaves seem to indicate the influence of *B. Lycium*.

× **Berberis Spaethii,** hybr. nov.

Frutex squarrosus latus patenter ramosus, ad ultra 3 m. altus; ramuli annotini pallide flavo-brunnei, teretiusculi, laeves, biennes vetustioresque cinerascentes vel nigrescentes; internodia 2–3.5 cm. longa; spinae saepissime simplices, flavo-brunneae, teretiusculae, 0.5–2 cm. longae. Folia ad 8-fasciculata, inaequalia, matura chartacea, ramulorum fertilium elliptica, ovato-oblonga vel obovata, apice acuta, rarius obtusa, mucronulata, basi cuneata, in petiolum ad 5 mm. longum attenuata, minimis exceptis 3.5 : 1.5 ad 6 : 2.3 vel 5 : 2 cm. magna, margine satis distincte spinuloso-serrata dentibus utrinque 8–15 versus apicem decrescentibus 1–2 mm. longis patentibus, superne satis obscure viridia, subtus pallide viridia vel cinerascentia, pruinosa, utraque pagina laxe elevato-reticulata (margines cellularum epidermidis faciei superioris rectae, inferioris leviter undulatae); folia ramulos novellos fulcientia aliis similia, interdum paullo longiora, surculorum late ovata vel elliptica, saepe subintegerrima, obtusiora, ad 5.5 : 3 cm. magna. Inflorescentiae paniculato-racemosae vel racemosae, satis densiflorae, ad ultra 6 cm. longae, axi satis crasso; pedicelli 5–8 mm. longi, apice leviter incrassati, bracteae novellae floresque juveniles satis evoluti nondum visi. Fructus elliptici, circiter 11 : 6 mm. magni, initio opaci, dein purpurascentes pruinosi, brevissime stylares; semina 2, circiter 7 mm. longa, atrobrunnea, levissime punctulata.

This is a very striking hybrid which came to the Arboretum in 1902 from the well known nurseries of L. Späth at Berlin-Baumschulenweg, with the name *B. angulizans* which is nothing but *B. canadensis* according to the figure by Massias in Hesdörffer's Monatsh. Blumenfreunde (1896) 100, tab. col. The plant, however, distributed by Späth under this name represents a hybrid of unknown origin. It flowered in the Arboretum in September 1906, and I collected fruits of the same plant in October, 1916 (no. 4578). It needs further observations and seems to represent a very remarkable form.

× **Berberis notabilis** Schneider in Silva Tarouca & Schneider, Uns. Freiland-Laubg. ed. 2, 116 (1922), **nomen seminudum.**

Frutex dense elongato-ramosus, squarrosus, ad 2.5 m. altus, ramuli annotini obscure brunnescentes vel cinereo-brunnei, teretiusculi vel striato-angulati, laeves, biennes satis cinerascentes, vetustiores cinerei; internodia 1.5–3 cm. longa; spinae simplices vel 3-fidae, patentes, brunnescentes, subtus sulcatae, mediae 5–15 mm. longae. Folia ad 7-fasciculata, inaequalia, matura satis chartacea, ramulorum fertilium obovato-oblonga vel

obovato-elliptica, apice rotundata, levissime mucronulata, basi satis subito in petiolum distinctum ad 13 mm. longum contracta, minimis exclusis 2.5 : 1.3 ad 5 : 2.2 cm. petiolis exclusis magna, superne satis glauco-viridia, subtus paullo discoloria et pruinosa, utraque pagina laxe elevato-nervata, (margines cellularum epidermidis utriusque facici aequimagnarum levissime undulatae vel subrectae), margine fere semper sed saepe satis indistincte breviter serrata dentibus minimis vel ad 0.5 mm. longis utrinque ad 20; folia ramulos novellos fulcientia similia sed saepe majora, ad 7 : 4 cm. magna petiolis ad 2 cm. longis exclusis, surculorum minora, elliptica, interdum subintegerrima, circiter 3–3.5 cm. longa et 1.5 cm. lata, breviter petiolata, subtus distinctius pruinosa. Inflorescentiae elongato-racemosae, 14–20-florae, floribus basi incipientibus, fructiferae ad 6 cm. longae; pedicelli satis tenues, fructiferi 10–15 mm. longi, apice paullo incrassati, basi bracteis ovato-triangularibus acuminatis circiter 2 mm. longis suffulti; flores aurei, aperti circiter 10 mm. diametientes; sepala externa prophylliformia ovato-oblonga, media similia majora internis late ellipticis vel obovato-ellipticis circiter 6 mm. longis fere duplo minora; petala circiter 6 mm. longa, obovato-elliptica apice leviter emarginata, basi paullo contracta, glandulis 2 ellipticis distinctis aurantiacis separatis praedita; stamina apice vix vel paullo apiculata, petalis $\frac{1}{3}$–$\frac{1}{4}$ breviora; ovarium elliptico-oblongum, stigmate sessili satis magno, ovulis 3–4 funiculo ovulo subaequilongo distincto stipitatis. Fructus ovato-elliptici, ad 15 : 10–11 mm. magni, estylares, cerasini et pruinosi; semina circiter 2, purpurea, levissime punctulata.

This fine large shrub has been in cultivation in the Arboretum under the name of *B. aristata*, of which I give a short account below. It was raised in 1895 from seeds collected from no. 67 which is *B. heteropoda* according to the material preserved in the herbarium. *B. notabilis* therefore undoubtedly represents a hybrid of *B. heteropoda*, and this origin is clearly shown by the characters of the leaves and by the distinctly stipitate ovules. The species which is to be regarded as the second parent I am not yet quite sure of. Some features point to *B. aristata* to which our plant is similar when flowering but *B. aristata* has leaves of a thicker texture and coarser serration, its racemes are not as large, and the fruits have shorter pedicels and short but distinct styles. The somewhat angular branchlets seem to indicate that a species of the *B. vulgaris* group may be the other parent. Whatever its origin this hybrid is a noble plant well worth cultivating.

Berberis aristata De Candolle, Syst. Nat. II. 8 (1821); Prodr. I. 106 (1824).—Schneider in Bull. Herb. Boiss. V. 451 (1905).

B. floribunda Lindley in Penny Cycl. IV. 261 (1835) pro parte, non Wallich.

This species was described by De Candolle from specimens in Herb. Lambert collected by Buchanan-Hamilton in Nepal which had been distributed by Buchanan under the name *B. chitria*. In his description

De Candolle says: "rami teretes, pallide grisei . . . racemi foliis paullo longiores, 2–3-pollicares, patuli, sat racemis *B. vulgaris* similes." Judging by this statement there can be no doubt as to the true *B. aristata*. Ker (in Bot. Reg. IX. tab. 729 [1823]) printed De Candolle's diagnosis but the plant figured is *B. chitria* Hamilton sensu Don (Prodr. Fl. Nep. 204 [1825]) which is an entirely different plant. Hooker f. et Thomson (Fl. Ind. I. 222 [1855]), too, did not separate *B. aristata* and *B. chitria*, and the last has been renamed *B. gratissima* by Klotzsch & Garcke (Bot. Ergeb. Reise Waldemar 130, t. 37 [1862]). Lindley in 1835 well distinguished the two species but he mistook *B. chitria* for *B. aristata*, and used for the latter the name *B. floribunda*.

According to Sweet (1826) and Don (1831) *B. chitria* was introduced into cultivation in 1820, and probably Wallich or another collector of his time introduced *B. aristata* at that time. Hamilton collected both species, and distributed them under the name *B. chitria*. Both are met with in European Gardens under such names as *B. coriacea*, *floribunda*, *asiatica*, *Wallichii*, *Wallichiana* and even *B. aetnensis*. *Berberis aristata* is a good garden plant, and the parent of quite a number of hybrids of which only a few can be dealt with in my present note. *Berberis coriaria* Royle (apud Lindley in Bot. Reg. XXVI. t. 46 [1841]) seems to be nothing but a variety of *B. aristata*. This plant was raised in the gardens of the London Horticultural Society from seeds sent by Royle in 1835, collected probably somewhere on the northwestern Himalayas. Unfortunately I have not found in any herbarium material from this region agreeing with Lindley's description and picture. A *Berberis coriaria* is mentioned by Kanjilal (For. Flor. 21 [1901]), by Collet, (Fl. Siml. 22 [1902]), and by Brandis (Ind. Trees, 30 [1906]), but I am quite unable to say what form these authors had in mind.

× **Berberis bella,** hybr. nov.

Frutex ut videtur vegetus, habitu *B. nummulariae*, ramis strictis elongatis; ramuli annotini purpurascentes et violascentes (pruinosi), laeves, leviter sulcato-angulati, biennes cinereo-fusci, subangulati, vetustiores nigrescentes; internodia 1.5–3 cm. longa; spinae infimae 3-partitae, ceterum simplices, validae, patentes, brunnei vel flavo-brunnei, subtus haud vel levissime sulcatae, applanatae, 1–4 cm. longae. Folia ad 8-fasciculata, inaequalia, matura rigide papyracea, ramulorum fertilium obovato- vel elliptico-oblonga, apice obtusa, rarius subacuta, minute mucronulata, basi cuneata, satis subito vel sensim in petiolum ad 1 cm. longum attenuata, integerrima vel saepe parce serrata, dentibus utrinque 1–6 distantibus vix 0.5 mm. longis, superne glauco-viridia, subtus glaucescentia, paullo discoloria, utraque pagina satis laxe reticulata (margines cellularum epidermidis faciei superioris leviter undulatae, inferioris subrectae; stomata in pagina superiori et papillae in pagina inferiori desunt), minimis exceptis 2 : 0.8 ad 4 : 2 cm. magna; folia ramulos novellos fulcientia surculorum-

que ovato-elliptica vel ovato-oblonga acutiora, pleraque grossius distanter serrata, ad 5 : 2.2 cm. magna, petiolo vix 1 cm. longo incluso. Inflorescentiae subspicatae, elongato-racemosae, densiflorae, iis *B. nummulariae* similes, 4–6 cm. longae pedunculo nudo ad 1.5 cm. longo incluso; pedicelli fructiferi vix ultra 7 mm. longi, bracteis lanceolatis acuminatis iis 3-plo brevioribus suffulti; flores flavi?, aperti 7–8 mm. diametientes; sepala externa parva prophylliformia ovato-triangularia, media iis multo majora, ovato-elliptica vel obovato-oblonga, circiter 5.5 mm. longa, integerrima vel apice leviter emarginata, basi vix contracta, glandulis 2 oblongis mediocribus aurantiacis separatis praedita; stamina petalis fere duplo breviora, apice vix apiculata; ovarium ovato-oblongum, substylare, stigmate mediocri, ovulis 2 subsessilibus instructum. Fructus elliptico-oblongi vel ovato-elliptici, pallide rubri, circiter 10–11 mm. longi, 5–6 mm. crassi, estylares vel stylo brevissimo coronati; semina 1–2, purpurascentia, circiter 7 mm. longa, minutissime punctulata.

Unfortunately I have not been able to study this very remarkable hybrid in a living state. It originated in 1888 from seeds of a plant which had been raised in this Arboretum from seeds received in 1874 from the Jardin des Plantes at Paris under the name *B. cretica*. According to the material preserved in the herbarium this first plant was *B. crataegina* DC., or a form of it. Of *B. bella* I saw flowering specimens collected June 7, 1900, and fruiting ones of October 31, 1898 (no. 62–1). In the shape of the leaves, their bluish green color, the strong spines and the color of the twigs, as well as in its dense inflorescences *B. bella* much resembles *B. nummularia* var. *pyrocarpa* Schneid. but the fruits are of about the same size as those of *B. vulgaris*. We do not at present know enough of *B. crataegina* and its behaviour in cultivation to make a positive statement as to the origin of *B. bella*. I am not even sure whether *B. vulgaris* is one of the parents. There is, however, in the herbarium material of another form raised in 1898 from seeds of *B. bella* consisting of flowering branches collected May 25, 1906 (no. 62–2). It is almost identical with *B. vulgaris* but the leaves are very narrow. In the old shrub-collection of the Arboretum *B. bella* had its place between *B. oblonga* (no. 671–2) and a form of *B. vulgaris* (no. 1417; received in 1880 from Spaeth as *B. laxiflora*). This no. 62–2 looks to me like a cross between *B. bella* and no. 1417, but not having seen young shoots and fruits I am unable to make a definite statement about it.

× **Berberis durobrivensis,** hybr. nov.

Frutex habitu ignoto, ramuli annotini rubro-brunnei vel novelli olivacei, sulcato-angulati, pruinosi, laeves, minute lenticellosi, biennes subteretiusculi, vetustiores nigro-cinerei; internodia 1–1.8 cm. longa; spinae debiles, simplices vel 3-fidae, flavae vel flavo-brunneae, mediae 3–8, vix ad 10 mm. longae. Folia ad 8-fasciculata, inaequalia, matura crasse papyracea, ramulorum fertilium oblanceolata vel anguste obovato-oblonga, apice

satis obtusa, basi sensim in petiolum subnullum vel ad 6 mm. longum attenuata, margine satis indistincte brevissime subdistanter denticulato-serrata vel subintegerrima, minimis exceptis 1.5 : 0.5 ad 2.8 : 1.3 cm. petiolo excluso magna, superne satis viridia, subtus discoloria, laete viridia vel cinerascentia, utrinque indistincte et laxe vel subanguste reticulata (margines cellularum epidermidis utriusque faciei aequimagnarum, subtus distinctius, undulatae); folia ramulos novellos fulcientia surculorumque latiora, majora, obovato- vel ovato-elliptica, obtusiora, basi subito in petiolum brevem contracta vel attenuata, distinctius distanter serrata, ad 4.5 : 1.8 vel 4.5 : 2.2 cm. petiolo incluso magna vel minora elliptica circiter 2.5 : 1.5 cm. magna. Inflorescentiae racemosae vel subumbellato-racemosae, densiflorae, interdum fere ad mediam nudae vel floribus basi incipientibus, pendentes, apice ramulorum versus saepe fasciculato-racemosae, 8- ad circiter 15-florae; pedicelli graciles, (3–)4–6 (infimi ad 8) mm. longae, bracteis anguste lanceolatis, acuminatis ad 2.5 mm. longis vel ovato-lanceolatis acutis brevioribus suffulti; flores ?lutei, satis parvi, aperti circiter ad 6 mm. diametientes; sepala externa ovato-lanceolata, parva, ut media late ovata illis fere duplo majora, rubescentia, interna obovata vel obovato-oblonga, circiter 5 mm. longa; petala obovato-oblonga, circiter 5.5 mm. longa, apice emarginata, basi breviter unguiculata, glandulis 2 subparvis ovoideis aurantiacis separatis praedita; stamina petalis circiter ⅓–¼ breviora, apice truncata vel leviter subemarginata; ovarium late ellipticum, stigmate sessili lato, ovulis (1–)2 sessilibus instructum. Fructus obovato-elliptici vel elliptici, ?sanguinei, ?pruinosi, 7–8 : 4–5 mm. magni, estylares; semen 1, dilute purpureo-brunneum, sublaeve, circiter 5 mm. longum.

I believe that I am quite right in assuming that *B. durobrivensis* is a hybrid between *B. canadensis* and *B. Poiretii*. I received several forms of it from the Highland Park at Rochester, N. Y. One, numbered 12, was sent in flower collected on June 8, 1908; fruiting branches were sent September 18, 1906 and September 8, 1916. It was called *B. macracantha*, and had ovate-lanceolate acute bracts like those of *B. canadensis*. The other (no. 19) consisted of fruiting specimens collected September 18, 1906 and October 11, 1916, and named *B. sinensis*, with lanceolate acuminate bracts like those of *B. Poiretii*. The form has nothing to do with either the true *B. macracantha* or *B. chinensis*.

Of *B. canadensis* I want to give a precise description and to add a few words as to its synonymy and history.

Berberis canadensis Miller, Gard. Dict. ed. 8, no. 3 (1768).—Münchhausen, Hausvater, v. 112 (1770).—J. S. Kerner, Darstell. Ausl. Bäume, 2, t. 15 (1796).

Berberis dumetorum, latissimo folio Herman, Par. Bot. Prodr. in Simon Warton, Schola Bot. 317 (1689).

Berberis, latissimo folio; canadensis H. R. Par. in Simon Warton, l. c. 289.

Berberis Mauritanica Boerhave, Ind. Pl. Hort. Lugd.-Bat. 260 (1710), fide Boerhave, Ind. alt. II. 233 (1720).
Berberis spinis triplicibus Berberis latissimo folio canadensis Linnaeus, Hort. Cliff. 122 (1737).
Berberis foliis obverso-ovatis Miller, Gard. Dict. ed. 7, no. 2 (1764).
Berberis vulgaris canadensis Aiton, Hort. Kew, I. 479 (1789).
Berberis pisifera Rafinesque, Silva Tellur. 68 (1838).
Berberis caroliniana Sweet, Hort. Brit. ed. 3, 19 (1839), nom. nud.
Berberis angulizans Massias in Gartenwelt, I. 100, t. col. (1896).
Berberis sinensis var. *canadensis* Regel in Act. Hort. Bot. Petrop. II. 416 (1873), excl. synon. Schrad.

Frutex erectus, satis laxe ramosus, ramis elongatis vix flexuosis, (0.5–) 1–2 m. altus; ramuli annotini flavo-brunnei vel obscure purpurascentes, angulati vel versus basim subteretes, lenticellis nigris minutissime punctulati, rarius omnino laeves, biennes vetustioresque nigro-purpurascentes, angulati, punctati, dein cinerascentes; internodia 1.5–4 cm. longa; spinae satis breves et debiles, pleraeque 3-fidae, atrobrunneae vel purpurascentes, subtus sulcatae, mediae 5 ad vix ultra 12 mm. longae, patentes. Folia ad 7-fasciculata, inaequalia, matura papyracea sed satis firma, ramulorum fertilium oblonga, obovato-oblonga vel anguste obovato-oblonga, apice obtusa, rotundata vel breviter acuta, minute mucronulata, basi cuneata, sensim in petiolum 3–6 mm. longum contracta, superne saturate viridia, subenervia vel graciliter laxe reticulata, subtus pleraque intense pallidiora, pruinosa, eodem modo vel paullo intensius reticulata (margines cellularum epidermidis utriusque faciei subaequimagnarum superne vix vel paullo subtus distinctius undulatae), minimis exceptis 2 : 0.6 ad 5 : 1.8(–2) cm. magna, margine subintegerrima vel utrinque dentibus satis brevibus 1–9 remotis subsinuato-dentata; folia ramulos novellos fulcientia surculorumve majora, obovato-oblonga, late obovata, elliptica vel ovato-elliptica, basi satis subito contracta, apice rotundata, interdum emarginata, ad 6 : 2 vel 5 : 2.5 (vel 5.5 : 3) cm. magna petiolis 0.5–1.5 cm. longis exclusis, textura et nervatione ut in aliis. Inflorescentiae fere semper subumbellato-racemosae, pedunculo nudo 1–3 cm. longo suffultae, 5–8-florae, vel distinctius racemosae, ad 12(–15)-florae, 2–4.5 cm. longae, saepe rubescentes; pedicelli graciles 5–10 mm. longi bracteis circiter 1.5 mm. longis triangularibus satis subito acuminatis suffulti; flores flavi, 8–9 mm. diametientes; sepala externa prophylliformia late triangularia, mediis ellipticis vel triangulari-ellipticis fere duplo minora, interna late obovata vel obovato-elliptica, 4–5 mm. longa, mediis duplo majora; petala obovato-oblonga, versus apicem paullo angustata, imo apice breviter vel vix incisa, basi satis unguiculata, glandulis 2 magnis ellipticis aurantiacis separatis praedita; stamina petalis ⅓ breviora, apice obtusa; ovarium crasse ellipticum, stigmate lato, ovulis 2 (rarissime 3–4) sessilibus instructum. Fructus elliptici vel obovato-elliptici, scarlatini (in sicco saepe nigrescentes), nitentes, epruinosi, 7–9 mm. longi, 6–7 mm. crassi, stigmate sessili; semina 1–2, circiter 5 mm. longa, ut videtur brunnea, minutissime punctulata.

Miller's *B. canadensis* is the same as *B. latissimo folio canadensis* H. R. Paris. He first mentions it in his Cat. Pl. (1730) saying: "The Canada Sort has rarely produced Fruit with us yet, but is very hardy and of quick growth." In the first edition of his Dict. (1731) Miller makes the following statement: "The *Canada Barberry* hath been of late Years introduc'd among us. The Leaves of this Tree are larger than those of the common Sort; but how its Fruits differ from the common I can't at present say, having not seen any produc'd in *England*, although the Tree is equally as hardy as the common Sort." The second edition contains the same text. In the third edition (1737) he says: "The . . . Sort; and the Fruit of this Sort is black when ripe; but I have not seen any produced in *England*. . . ." In the following editions we find the same quotation, but in the seventh he drops the remark "but I have . . . in *England*." The eighth edition contains the following statement: "The Canada sort was more common in the English gardens, some years past, than at present. The leaves of this are much broader and shorter than those of the common sort, and the fruit is black when ripe. . . ." According to Simon Warton's Schola Botanica and Herman's catalogue of the Parisian garden in Warton's book *B. canadensis* was there already as early as 1689. There seems to be a specimen in Herb. Tournefort which however I have not yet seen. There is no type present in Miller's Herbarium in the British Museum (Natural History) according to Dr. C. Baker's information given to Mr. Bean in 1917. Miller's statement that the fruits are black may be based on dried fruits which sometimes become blackish red. Münchhausen (1770) says that the species rarely bears ripe fruits which are clearly distinct from those of *vulgaris*. Marshall, Arbust. Americ. 17 (1785) says under *B. canadiensis* (!): "There is also a kind of Barberry growing upon New River in Virginia, bearing red berries, of which I have seen one small plant." Duroi, Die Harbkesche Wilde Baumzucht ed. 2, 1. 126 (1795), remarks about *B. canadensis:* "Ich nehme ihn mit anderen neueren Schriftstellern für eine blosse Abart unseres Berberitzenstrauches an, da seine Unterscheidungszeichen sehr gering sind. Die Blätter finde ich nicht, wie Miller angiebt, breiter und kürzer als an unserem einheimischen Strauche. Sie sind aber nicht wie an jenem an ihrem ganzen Rande, sondern nur zur Hälfte von ihrer Spitze an sägeförmig gezähnt und viele an den Spitzen der Zweige gar nicht. Auch sind die Trauben der Blumen etwas kürzer." Willdenow, Berlin. Baumzucht ed. 2, 62 (1811), says of *B. vulgaris* var. *canadensis*: "Diese Spielart kommt aus Nordamerika, macht aber keine besondere Art aus, sondern geht mit der Zeit in die gewöhnliche über. Ihre Beeren sind sehr dunkelviolett, die jungen Schösslinge aus der Wurzel haben lange einfache Stacheln, und die Blätter der Schösslinge sind nur an der Spitze mit einigen Zähnen besetzt." Kerner's plate (1796) clearly represents our species, he does not give a description but refers to Burgsdorf, Anleit. Erzieh. Holzarten 1. 32, no. 91 (1787), who however says nothing but: "Sommergrün; stachlicht Strauchholz;

dauerhaft; bringt bey uns reifen Saamen." He adds "Miller 2." Burgsdorf, l. c. 33, under no. 93 indicates another form: "*B. humilis*. Der Zwerg-Berbisbeer-Strauch. La petite Épine vinette de Virginie. The American dwarf Barberry. Sommergrün; Erdholz; dauerhaft; bringt bey uns Saamen. Loddiges Cat. (Ist. nicht beschrieben)." This form, too, seems to be *B. canadensis*.

This species probably came to France soon after the first French settlers went in Virginia. They were aware of the value of the fruits for sweets that were highly esteemed at that time in France. In England the species apparently soon disappeared from gardens until 1828 when it was reintroduced according to Sweet (as *B. caroliniana*). At present the true *B. canadensis* is rarely to be seen in European gardens according to Bean's statement and my own observations; the name *B. canadensis* is often used for forms of the *B. emarginata-provincialis* group. *Berberis canadensis* is well characterized by its dark, finely pustulate branches, the somewhat whitish undersurface of its scarcely veined, rather smooth leaves which on vigorous shoots are rather broad or almost roundish with a coarse subundulate dentation, by its rather small pale yellow flowers, and its ellipsoidal fruits of a shining almost lacquered red.

The following forms seem to represent hybrids between *B. canadensis* and the European *B. vulgaris*.

× Berberis declinata Schrader in Linnaea XII. 368 (1838).—Schneider in Mitt. Deutsch. Dendr. Ges. XV. 177 (1907).

? *B. crenulata* Schrader, l. c. 362.

B. caroliniana d) *B. declinata* Koch, Dendrol. I. 399 (1869).

Frutex ut videtur squarrosus; ramuli annotini flavescentes vel brunnescentes sed distincte violascentes, satis angulato-sulcati, laeves, vel ut biennes sordide brunnescenti-cinerascentes et nigro-punctati, vetustiores nigrescentes; internodia 1.5–2(–2.5) cm. longa; spinae 3-fidae vel simplices, satis debiles, flavescentes, subtus sulcatae, mediae 8–10 mm. longae (vel inferiores validiores ad 2.5 cm. longae), lateralibus longiores. Folia ad 6-fasciculata, inaequalia, matura crasse papyracea, ramulorum fertilium obovato-oblonga, vel obovato-elliptica, apice obtusa vel breviter acuta, minute mucronulata, basi satis subito in petiolum 2–10(–15) mm. longum contracta, margine indistincte vel minute satis distanter (rarius angustius) serrata vel subintegerrima, minimis exceptis 2 : 0.9 ad 2.5 : 1.5 (vel 4.5 : 2) cm. petiolis exceptis magna, superne saturate viridia, subtus discoloria, cinerascentia vel glaucescentia, pruinosa, utraque pagina satis laxe et tenuiter reticulata, (margines cellularum epidermidis utriusque faciei fere aequimagnarum subrectae vel leviter undulatae); folia ramulos juveniles fulcientia majora, obovato- vel elliptico-oblonga, grossius et distantius serrata (serraturis inferioribus ad 2 mm. longis), ad 5 : 2.5 (vel ad 7 : 3.5) cm. magna petiolo ad 1 cm. longo incluso, surculorum ovato-elliptica vel late elliptica, satis obtusa, distanter

grosse serrata vel subintegerrima, 2.5 : 1.5 ad 5 : 2.5 cm. magna petiolo brevi incluso, subtus valde glaucescentia, utrinque laxe elevato-reticulata. Inflorescentiae racemosae vel racemoso-umbellatae, pedunculo 1–2 cm. longo nudo saepissime instructae (rarius summae subfasciculato-racemosae), circiter 3–5 cm. vel infimae ad 7 cm. longae; pedicelli partim verticillati, satis graciles, inferiores ad 11, superiores circiter 7–5 mm. longi, bracteis lanceolatis acuminatis 1.5–2 mm. longis suffulti; flores mediocres vel satis parvi, circiter 6–7 mm. diam., lutei, extus rubescentes; sepala externa minima prophylliformia, media late ovata, internis late obovatis minora, interna obovato-oblonga, circiter 4.5 mm. longa petala obovato-elliptica, circiter 5 mm. longa, apice subtruncato leviter emarginata, basi vix vel satis distincte breviter unguiculata, glandulis 2 oblongis satis magnis aurantiacis separatis praedita; stamina petalis ⅓ breviora, apice subobtusa; ovarium ellipticum, stigmate satis lato, ovulis 2 subsessilibus. Fructus obovato- vel oblongo-elliptici, ad 9 : 4.5 vel 10 : 5 mm. magni, sanguinei?, vix vel paullo pruinosi; semina 1–2, rubro-brunnea, circiter 5–5.5 mm. longa, levissime punctulata.

Schrader cites a "*Berb. sinensis monsp. viridis* 1832" a quotation I have been unable to elucidate. According to the type I had before me in 1906 I believe that this form represents a cross between *B. canadensis* and *B. vulgaris*. Therefore I accept Schrader's name for this hybrid to which I refer specimens received from the Botanic Garden at Copenhagen, collected on June 10 and October, 1916 (no. 4814/16, as *B. brachybotrys*) from which the above description is partly drawn. Another specimen from the same garden, collected May, 1915 and October, 1916 (no. 4, G.O./189; as *B. glauca* ex Hort. Grenoble), seems to be a form of the same origin rather more closely approaching *B. vulgaris*. At the Arnold Arboretum there was a plant under no. 4577 (ex Hort. Späth before 1902, as *B. brachybotrys*) of which I saw specimens collected on May 31 and September 8, 1906. It has relatively long racemes (5–7 cm.), marked also by the somewhat verticillate arrangement of the flowers which seems to be a peculiar feature of hybrids of *B. canadensis*. The bracts of no. 4577 are shorter and obtuser more like those of *B. canadensis*. The habit however points to *B. vulgaris* of which it almost has the flowers. The fruits are ellipsoidal or obovate-ellipsoid, measuring up to 9 : 5 mm. The vigorous shoots are dirty gray, and the brownish yellow spines are up to 1.5 cm. long and distinctly furrowed beneath.

From Copenhagen I have received under no. 4814 (Arnold, 1903) specimens collected in June and October, 1916, which represent a form, sent to Copenhagen from the Arboretum in 1903 as *B. canadensis*. It agrees rather well with *B. declinata* but it may be a cross of *canadensis* with *B. amurensis*. It seems, however, impossible to describe this form as a distinct hybrid. A plant from the Kew Arboretum collected on May 11, 1880 and July 9, 1882 named *B. vulgaris hypoleuca* (no. 664) probably

also belongs to *B. declinata*. The following form I wish to describe as a rather distinct variety apparently of the same origin.

× **Berberis declinata** var. **oxyphylla**, n. var.

Frutex habitu ignoso; ramuli annotini satis obscure vel sordide brunnescentes, striato-angulati vel angulato-sulcati, lenticellis minimis punctati, biennes cinerascentes vel cinereo-brunnescentes, vetustiores cinerascentes vel nigrescentes; internodia 1–2 cm. longa; spinae ramulorum juvenilium satis evolutae, flavescentes vel brunnescentes, 3-fidae vel versus apicem simplices, subtus sulcatae, mediae ad 2 cm. longae, lateralibus longiores. Folia ad 8-fasciculata, inaequalia, matura crasse papyracea, ramulorum fertilium elliptico-lanceolata, elliptica vel obovato-oblonga, apice acuta vel acutiuscula, basi cuneata satis subito in petiolum 1–6 mm. longum attenuata, margine fere semper densissime graciliter serrulata serraturis 0.2–0.7 mm. longis inaequalibus circiter (4–)5 pro 5 mm., minimis exceptis 2.5 : 1 ad 3.5 : 1.5 vel ad 4 : 2 cm. magna petiolis exclusis, superne saturate viridia, subtus laete viridia vel interdum paullo pruinosa, utrinque (subtus distinctius) satis anguste elevato-reticulata, (margines cellularum epidermidis paginae superioris valde undulatae inferioris minime vel indistincte undulatae); folia ramulos novellos fulcientia surculorumque similia vel magis lanceolata, acutiora, apice longius mucronulata, basi sensim attenuata, margine satis distincte et interdum sinuato-spinuloso-serrata, dentibus interdum ad 3 mm longis, utrinque 2–6, minora 2 : 0.6, majora ad 4–5 : 1 cm. magna petiolo ad 6 mm. longo incluso, subtus pruinosa, glaucescentia, utrinque laxius reticulata. Inflorescentiae racemosae, inferne nudae, vel versus apicem ramuli breviter racemosae, 4–5 mm. longae, circiter 8–18-florae, pedicello fructifero 4–7 mm. longo, bractea late lanceolata acuta vel breviter acuminata 1–1.5(–2) mm. longa suffulto; flores ut videtur pallide lutei, extus rubescentes, satis parvi, 5–6 mm. diam.; sepala externa prophylliformia ovato-triangularia, minima, media iis duplo majora elliptico-ovata, interna late obovata vel obovato-elliptica, 4–4.5 mm. longa, apice satis emarginata, basi leviter unguiculata, glandulis 2 satis parvis ovoideis aurantiacis distantibus praedita; stamina petalis ⅓ breviora, apice vix apiculata; ovarium ovato-ellipticum, stigmate mediocri sessili, ovulis 2 subsessilibus. Fructus sanguinei?, paullo pruinosi, elliptici vel obovato-elliptici, circiter 9 : 4–4.5 mm. magni, estylares; semen 1, purpureum, laeve, circiter 5–5.5 mm. longum.

This form came to the Highland Park at Rochester, N. Y., as *B. actinacantha* from Spaeth's nurseries at Berlin. I received specimens collected on June 8, and October 15, 1907 and October 12, 1916, under no. 25 which is the type of the variety, and no. 23 which is a form slightly more like typical *B. declinata*. The variety is conspicuous by its relatively acute leaves which are very finely and densely serrate on the flowering branches while those of the shoots have a wider and coarser serration and

are distinctly pruinose beneath. The spines are rather stout. The dull brown twigs with minute lenticelles, the short bracts and other features of the flowers strongly point to *B. canadensis*, the other parent being either *B. vulgaris* (or possibly *B. amurensis* var. *japonica* Rehd.). The undulate margins of the cells of the upper epidermis of the leaves are present in both species.

In the Gray Herbarium I have seen a specimen marked apparently by Spach "*B. aetnensis* Rafin." from the Botanic Garden at Paris of which the flowering branch easily might be taken for *B. declinata oxyphylla.* Of the two other sterile branches the narrow obovate leaves show the same fine, almost aristate serration and measure 2 : 1 up to 4 : 2.8 cm. without the petiole which is 5–10 mm. long. The 2–3-year-old branches are dirty grayish-brown, minutely punctate, the spines brownish and up to 12 mm. long. Probably the cross *B. canadensis* with *B. vulgaris* first originated at Paris where *B. canadensis* was in cultivation at a very early time.

The following hybrid forms are often met with in gardens under the name of *B. canadensis* but, in my opinion, have nothing in common with that species.

Berberis laxiflora Schrader in Linnaea, XII. 367 (1838).—Schneider in Mitt. Deutsch. Dendr. Ges. VIII. 177 (1907).

Frutex ad ultra 2 m. altus, ramis virgatis subdeflexis, ramulis declinatis; ramuli annotini griseo-brunnei (vel ex Schrader surculi pallide sanguinei), valde angulato-sulcati, biennes cinerascentes; internodia 1–2.5 cm. longa; spinae simplices vel 3-fidae, brunnescentes vel cinerascentes, subtus sulcatae, mediae 0.7–1.5 cm. longae, lateralibus longiores. Folia ad 8-fasciculata, valde inaequalia, papyracea, ramulorum fertilium obovato-oblonga, apice acutiuscula, mucronulata, basim versus subsensim in petiolum 7–10 mm. longum attenuata, minute vel parce vel subdistincte serrata vel subintegra, minimis exceptis 2 : 0.9–4, 5 : 2, rarius ad 6.5 : 3.2 cm. magna, superne saturate viridia, subtus cinereo-viridia utrinque laxe sed distincte elevato-reticulata, ramulos juveniles fulcescentia majora, cuneiformi-obovata, in petiolum longiorem desinentia, grossius serrata, ad 4 : 1.7–7 : 3.5 cm. magna petiolo ad 18 mm. longo excluso, surculorum late ovata vel ovato-elliptica, apice rotundata, basi subito in petiolum circiter 5 mm. longum contracta, grossius distantius saepe subsinuato-serrata, serraturis 0.5–1.5 mm. longis, circiter 3.5–4.5 longa et 2.5–3 cm. lata, subtus distinctius glaucescentia (pruinosa). Inflorescentiae elongato-racemosae, pendentes, 3.5–9 cm. longae, basi vel vix nudae; pedicelli fructiferi infimi ad fere 2 cm., superiores 6–10 mm. longi; bracteae lanceolatae, acuminatae, 1.5 ad fere 3 mm. longae; flores (colore *B. vulgaris?*) circiter 7 mm. diam.; sepala (externa minima prophylliformia et cito caduca?) media late ovata internis late ovato-ellipticis vel obovatis circiter 5 mm. longis duplo minora; petala circiter

5–5.5 mm. longa, obovata, apice leviter emarginata vel subretusa, basi paullo attenuata, glandulis 2 satis magnis ovoideo-oblongis aurantiacis separatis praedita; stamina normalia ut in *B. vulgari;* ovarium oblongo-ellipticum, stigmate satis lato sessili, ovulis 2 subsessilibus. Fructus oblongo-elliptici, circiter 10 : 5 mm. magni stigmate sessili excluso, ex cl. Schrader initio pallide sanguinei, deinde saturate sanguinei vel coccinei; semina?.

Schrader's type is a very uncertain form supposed to have come from America. I first thought it might be nothing but *B. vulgaris* brought back from America because it has no connection whatever with *B. canadensis.* At present I am inclined to consider *B. laxiflora* a cross between *B. chinensis* and some form of *B. vulgaris.* The long racemes bear some resemblance to those of *B. amurensis* as I said in 1907 but this species had not yet been introduced at Schrader's time. Later *B. laxiflora* mostly has been taken for *B. vulgaris* but there are so many forms in cultivation under the name *B. laxiflora* that it is impossible to decide which form a certain author may have had in mind. It is not without some hesitation that I propose to keep Schrader's name for what I regard as a cross between *B. chinensis* and *B. vulgaris.* There seem to be in gardens also some rather different forms of this origin which may be distinguished as follows:

Ramuli annotini flavo-cinerei vel cinereo-brunnescentes (non satis brunnescentes vel violascentes).
Folia ramulorum floriferorum anguste obovato-oblonga, circiter 10–20 mm. lata, subobtusa, satis parce vel indistincte serrato-denticulata vel subintegerrima. var. *typica.*
Folia ramulorum floriferorum oblanceolata, 6–15 mm. lata, acutiora, satis dense breviter serrulata. . . . . var. *oblanceolata.*
Ramuli annotini satis distincte purpureo-brunnei, etiam biennes brunnescenti-cinerascentes; folia ramulorum floriferorum obovato-oblonga vel obovato-elliptica, breviter vel grossius satis distanter serrato-dentata. . . . var. *Langeana.*

× **Berberis laxiflora** var. **oblanceolata,** var. nov.

Frutex ad ultra 1 m. altus, habitu ut videtur *B. chinensis* ramis elongatis, ramulis plus minusve dependentibus; ramuli annotini flavo-cinerei vel cinereo-brunnescentes, sulcato-angulati, biennes cinerascentes; internodia 1.5–2.5 cm. longa; spinae satis debiles, simplices vel inferiores 3-fidae (surculorum non visae), leviter brunnescentes, subtus vix vel paullo sulcatae, mediae ad 8 mm. longae. Folia ad 8-fasciculata, matura papyracea, ramulorum fertilium oblanceolata, apice acuta vel subacuta, basi sensim in petiolum vix ad 5 mm. longum attenuata, margine distincte serrulata dentibus utrinque 8–15 minimis vel ad 0.75 mm. longis, 2–4 cm. longa et 0.6–1.3 cm. lata, superne viridia, subtus paullo discoloria, (vel subcinerascentia?), utraque facie satis anguste vel superne laxius reticulata (margines cellularum epidermidis utrinque aequimagnarum distincte undulatae); ea ramulos juveniles fulcientia vel surculorum ut videtur majoribus simillima (vel in formis similibus folia surculorum latiora), elliptica, vel ovato-elliptica, obtusiora, minus dense vel vix serrata, basi subito in petiolum brevem contracta, 3–5 cm. longa et 1.3–2 cm. lata. Inflore-

scentiae racemosae, ad 5.5 (vel 7) cm. longae, pedunculo nudo 1–2 cm. longo incluso, satis laxiflorae, cum ramulis pendentes; pedicelli graciles, infimi ad 10, superiores 5–7 mm. longi, bracteis anguste lanceolatis acuminatis circiter 2 mm. longis suffulti; flores lutei (?), aperti circiter 7 mm. diametientes (?); sepala externa prophylliformia ovato-lanceolata, media ovato-elliptica vel elliptico-oblonga illis fere duplo majora, interna obovata vel obovato-oblonga, satis angusta, 3.5–4 mm. longa; petala obovato-elliptica, 4–4.5 mm. longa, apice breviter inciso-emarginata, basi vix vel distinctius subunguiculata, glandulis 2 aureis oblongis separatis mediocribus praedita; stamina petalis ⅓ breviora, apice truncata; ovarium elliptico-oblongum, stigmate satis crasso sessili, ovulis 2 sessilibus. Fructus elliptico-oblongi, ad 11 : 4–5 mm. magni, ut videtur pallide vel atro-sanguinei, interdum paullo pruinosi; semen 1, ad 7 mm. longum, atro-purpureum, minutissime punctulatum.

This variety comes very near the typical *B. laxiflora* but looks rather different at first sight with its mostly much narrower leaves which have a richer and closer serration. Apart from this serration and the yellow-grayish color of the young twigs one might take it for *B. chinensis*. As the type I regard specimens from the Harvard Botanical Garden collected on May 27, 1880 (flowers) and October, 1879 (fruits), and preserved in the Herbarium of the Arnold Arboretum. Plants cultivated in that Arboretum in 1903, of which flowers have been collected by Rehder on May 22, agree well with the type. A plant from the Kew Arboretum, collected in October, 1906 (as *B. sinensis* no. 2), seems also to belong to this variety.

× **B. laxiflora** var. **Langeana,** var. nov.

Frutex erectus, ut videtur habitu *B. vulgaris*, ramis satis crassis, ramulis ut videtur pendentibus, ad ultra 1.5 m. altus; ramuli annotini distincte purpureo-brunnescentes, sulcato-angulati, etiam biennes brunnescenti-cinerei, deinde cinerascentes vel vetustiores nigrescentes, internodia 1.5–3 cm. longa; spinae summis exceptis satis validae, simplices vel 3-fidae, brunnescentes vel flavo-brunnescentes, subtus sulcatae, mediae 1–3.5 cm. longae, latioribus angulo recto patentibus vix longiores. Folia ad 8-fasciculata, valde inaequalia, matura crasse papyracea, ramulorum fertilium obovato-oblonga vel obovato-elliptica, apice satis obtusa, basi cuneato satis subito in petiolum 3–12 mm. longum attenuata, margine integra vel parce et subtiliter serrata, rarius (majora inferiora) distincte et satis anguste serrulata, minimis exceptis 2–6 cm. petiolo incluso longa et 0.8–2.5 cm. lata, superne intense viridia, subtus pallidiora, leviter glaucescentia, pruinosa, utrinque paullo laxius quam in *B. vulgari* reticulata (margines cellularum epidermidis paginae superioris subrectae, inferioris paullo undulatae); ea ramulos novellos fulcientia majoribus alteris similia vel majora et distinctius serrato-dentata, surculorum ovato-elliptica, acutiora, subito in petiolum brevem contracta, pleraque distincte

serrulata, serraturis ad 1.5 mm. longis circiter 4–5 pro 1 cm., ad 5.5 : 2.5 cm. magna, subtus distinctius glaucescentia. Inflorescentiae racemosae vel versus apicem ramulorum fasciculato-racemosae, 2.5–4 cm. longae; pedicelli inferiores ad 12 mm., superiores 5–7 mm. longi, bracteis lanceolatis acuminatis 2–3 mm. longis suffulti; flores ut videtur lutei, interdum extus rubescentes, aperti circiter 7–8 mm. diametientes; sepala externa prophylliformia lanceolata, minima, cito decidua, media elliptica vel late ovata, internis obovatis vel obovato-ellipticis 4.5–6.5 mm. longis ⅓ vel duplo minora; petala obovato-oblonga 5–6.5 mm. longa, apice leviter vel vix emarginata, basi vix vel distinctius contracta, glandulis 2 irregulariter oblongis aurantiacis separatis satis magnis praedita; stamina petalis ⅓ breviora, apice subtruncata, ovarium ovato- vel elliptico-oblongum, stigmate satis lato, ovulis 2 fere sessilibus. Fructus ? sanguinei, partim pruinosi, elliptici vel ovato-elliptici, 9–10 : 4–5 mm. magni stigmate sessili excluso; semen 1, circiter 6–7 mm. longum, rubro-brunneum, minutissime punctulatum.

This form I received as *B. serotina* from the Botanic Garden at Copenhagen in flowering and fruiting specimens collected in June and October of 1916 (no. 4814/27). The type had been raised from seeds of *B. serotina* J. Lange in memory of whom I name it. Quite identical with the type is another form from the same garden collected at the same time and raised from seeds of *B. Guimpelii* (no. 4814/21). Both show the influence of *B. vulgaris* in their large leaves, the color of the branchlets and in their strong spines. They differ from the typical *B. laxiflora* in the more robust thorns, the distinctly brown-red young twigs, and the shorter inflorescence; from var. *oblanceolata* they may be distinguished by their wider, much less dentate or almost entire leaves and by the color of the twigs. In its habit, var. *Langeana* is probably more like *B. vulgaris* while var. *oblanceolata* resembles more *B. chinensis*. A specimen from Kew, collected October, 1916 (no. 14, received under no. 59–03 from Berlin as *B. Guimpeli*) seems to belong to var. *Langeana* or typical *laxiflora*. A synonym of it may be *B. sulcata* Koch et Bouché (in Ind. Sem. Hort. Berol. 1854, App. Gen. Spec. nov. p. 12), so far as can be judged from the description only.

To understand clearly this hybrid and other critical forms found in gardens one should be well acquainted with the true *B. chinensis* of which I will add the following description and remarks.

Berberis chinensis Poiret in Lamarck, Encycl. VIII. 617 (1808).

B. sinensis Desfontaines, Tabl. École Bot. 150 (1804), nom. nud.; ed. 2, 175 (1815), nom. nud.; Hist. Arb. Arbriss. II. 27 (1809), cum descr. manca.—Loiseleur-Deséglise, Herb. Gén. Amat. VII. 487, tab. col. (1824), excl. synon. pro parte.—Watson, Dendrol. Brit. I. tab. 26 (1825).—Hooker in Bot. Mag. CVII. t. 6573 (1881).—Schneider in Mitt. Deutsch. Dendr. Ges. XV. 179 (1907).

B. vulgaris var. ? *iberica* Steven et Fischer in litt. ex De Candolle Syst. Nat. II. 6 (1821).

B. iberica Sweet, Hort. Brit. 13 (1826).—Schneider in Bull. Herb. Boiss. V. 656 (1905).

B. canadensis Guimpel, Otto et Hayne, Abb. Fremd. Holzart. I. 79, t. 63 (1819-1825), non Miller.
B. spathulata Schrader in Linnaea, XII. 376 (1838).—Schneider in Mitt. Deutsch. Dendr. Ges. XV. 179 (1907).
? *B. laxa* Rafinesque, Sylva Tellur. 68 (1838).
B. (vulgaris) spathulata Gordon in Gard. Mag. n. s. VI. (XVI.) 2 (1840).
B. aristata var. *sinensis* Koch, Hort. Dendr. 18 (1853).
B. Guimpeli Koch et Bouché, Ind. Pl. Hort. Berol. 1854, App. 13.
B. intermedia Koch, Dendrol. I. 404 (1869).
B. serotina Lange, Ind. Sem. Hort. Bot. Haun. 1872, adnot. p. 5; in Bot. Tidskr. ser. 3, II. 138, t. 4 (1879).

Frutex erectus, dense elongato-ramosus, circiter 1.5–2, interdum ad 3 m. altus, ramis apice deflexis vel nutantibus, stolonibus subterraneis; ramuli annotini rubro-brunnei, purpurascentes vel fusco-purpurei, saepe nitidi, distincte sulcato-angulati, biennes similes vel ut vetustiores cinerascentes; internodia 1.5–2 cm. longa; spinae ramulorum fertilium simplices vel 3-fidae, interdum valde reductae, flavo-brunneae vel purpurascentes, mediae 0.5–1.8 cm. longae, subtus planae vel sulcatae, surculorum nondum visae. Folia ad 8-fasciculata, inaequalia, matura papyracea sed firma, ramulorum fertilium oblanceolata, spathulata, obovato-lanceolata, anguste ovali-oblonga vel elliptico-oblonga, apice acuta vel subobtusa, mucronulata, basim versus sensim in petiolum 1–8 mm. longum attenuata, margine integerrima vel utrinque dentibus 1–5 serrulato-dentata, 1.6–4 cm. longa et 0.5–1 vel 1.3 cm. lata, superne laete viridia, nitentia, subtus pallide viridia, utraque pagina (in vivo minus distincte) laxe elevato-reticulata, (margines cellularum epidermidis utriusque faciei fere aequimagnarum superne rectae vel vix undulatae subtus pleraeque levissime undulatae); folia ramulos novellos fulcientia surculorumque aliis similia vel satis late elliptica, ad 4.5 cm. petiolo ad 1 cm. longo excluso longa et ad 1.8 vel 2 cm. lata, saepius serrulata dentibus utrinque ad 12 subpatentibus. Inflorescentiae racemosae (apice ramulorum interdum abbreviatae depauperatae) breviter pedunculatae vel saepius pedunculo nudo interdum ad 3 cm. longo instructae, ad 7 cm. longae, 10–20-florae; pedicelli interdum ex parte verticillati, graciles, fructiferi (6)7–15 mm. longi, saepe rubescentes, bracteis lanceolatis acuminatis 2–4 mm. longis suffulti; flores mediocres, 6–8 mm. diametientes, citrini vel lutei; sepala externa prophylliformia anguste vel late triangularia, saepe rubescentia, sepalis mediis ovatis vel late ovato-ellipticis obtusis circiter 3–3.5 mm. longis sub duplo minora, interna late obovata, 4–5.5 mm. longa; petala 4–5 m. longa, obovato-oblonga, apice emarginata, basi pleraque breviter unguiculata, glandulis 2 oblongis aurantiacis separatis praedita; stamina petalis ⅓ breviora, apice truncata vel levissime repando-apiculata, ovarium anguste ellipticum, stigmate lato brevi, ovulis 1–2 sessilibus instructum. Fructus elliptici vel anguste elliptici, 9–10(–11) : 4–5 mm. magni, maturi cerasini vel atropurpurei, partim pruinosi; semen plerumque 1 (interdum 2), initio ut videtur flavo-brunneum, deinde brunneo-purpureum, minutissime corrugatum.

This species has been in cultivation for a long time. It was first mentioned by Desfontaines in 1804 without a description as *B. sinensis* from the Jardin des Plantes. Poiret described it first in 1808 as *B. chinensis*. The form described by Poiret seems to be the same as that figured by Loiseleur-Deslongschamps in 1824; Hooker's plate, too, agrees well with it, but the flowers are painted rather pale and pure yellow while the color is deep-yellow with reddish outer sepals on Loiseleur's plate. Spach (Hist. Vég. VIII. 42 [1839]) says: "Fleurs d'un jaune vif. Sepals souvent lavés de rouge en dessous." He also well describes the variability of the inflorescence, saying: "Grappes longues de 1 pouce à 4 pouces, tantôt sessiles ou sousessiles, tantôt plus ou moins longuement pedonculées, assez lâches, ou rarement un peu denses. . . ." As to the color and size of the fruits the statements differ somewhat; Poiret says: "Les fruits sont des baies d'un rouge un peu jaunâtre, ovales, obtuses, un peu rétrécies à leur base, légérement ombiliquées à leur sommet, plus petit que celles du *berberis vulgaris*." Loiseleur states: "Le fruit est une baie ovale rouge, d'un rouge foncé. . . ." Spach describes the berries "d'un pourpre plus ou moins foncé, du volume de celles du *Berberis* commun." Schrader who had before him the true plant says that the berries are "cerasinae," which is a true description of the color according to my own observations. One might also say atrosanguineae or plume-red. The color of the fruits is, however, somewhat different according to its condition of ripeness.

As to the different synonyms mentioned above the following is to be said. On the plate of Guimpel the petals are entire, and Koch et Bouché l. c. also describe the petals of *B. Guimpelii* as "rotundata integerrima." Of its relationship the authors say: "*B. sinensis* Desf. frutice elatiore ramis erectis sulcatis et racemis erectis discrepat. Nostrae proxima est *B. spathulata* Schr. (*B. canadensis* Tausch) quae habitu elatiore distinguitur." In his Dendrology Koch, however, says that the flowers are "langgestielt bisweilen zu 2 und 3 an einem verlängerten, allgemeinen Stiel eine überhängende Traube bildend" a very different statement from "racemis erectis." Of Schrader's *B. spathulata* I already pointed out in 1907 that it is nothing else than *B. chinensis*. Schrader describes the branchlets as "ferrugineo-castanei," they become grayish very soon. The only peculiar feature of *B. Guimpelii* would be the entire petals but I suppose that is a wrong statement or that that condition occurs only occasionally. The specimens distributed by Koehne (Herb. Dendr. no. 217) who certainly was well acquainted with Koch's plant has distinctly emarginate petals. His specimen with "racemis insolito abbreviatis, qui in stirpibus junioribus saepe occurrere videntur" is a good proof of the variability of the inflorescences of which the lowermost pedicels sometimes are almost subpaniculate as it is well indicated on Guimpel's plate. In the Herbarium of Copenhagen I found a plant of which the inflorescences were rather distinctly paniculate in their lower part, but otherwise I could not detect any hybrid influence of another species. Unfortunately the origin of this plant is not known.

After all I cannot regard *B. Guimpeli* and *B. spathulata* as different from typical *B. chinensis*. *Berberis serotina* of Lange, too, of which I have had the type before me, agrees well enough with it. On Lange's plate the styles of the fruits are too long, and other characters of the flowers, too, are not correctly represented. Some specimens, however, collected at the Forsthave at Charlottenlund on September 29, 1867, have a very short style while it is wanting entirely on specimens collected in 1874. These forms with a very short style resemble certain forms of *B. crataegina* which have been very imperfectly known.

As to the native country of *B. chinensis* we are now sure that it is not identical with any species from China or eastern Asia, and that it cannot be separated from what I called *B. iberica* in 1905. I do not know the precise locality where the type of *B. iberica* was found; the indication "Caucasus" being a rather uncertain statement. Already Lindley (in Penny Cycl. IV. 261 [1835]) stated that *B. iberica* "mostly resembles" *B. sinensis*, his *B. sinensis* being *B. Poiretii*. Rightly he identifies Watson's plant of the Dendrol. Brit. with *B. iberica*, and Hooker f. in 1881 (l. c.) says that "a Caucasian plant received from St. Petersburg, and bearing this name, resembles it entirely in foliage, but the flowers are more umbellate towards the end of the raceme." It seems that it was first introduced to Paris, in Hort. Lemmonier, as De Candolle states in 1821. Tournefort may have brought it from Asia Minor as early as 1702. The type of *B. sinensis* var. *paphlagonica* Schneider was collected by Sintenis (no. 3446) in the Wilajet Kastambuli. As I have not seen the specimens mentioned by Boissier et Buhse (Aufz. Reise Transkauk. Pers. Ges. Pflanz. 8 [1860]) from northern Persia and referred to *B. vulgaris iberica*.

The next hybrid Berberis I wish to deal with in this note is a cross between the well known Japanese *B. Thunbergii* and *B. vulgaris*. It seems best to give first a good description of *B. Thunbergi* , and an enumeration of its garden forms.

Berberis Thunbergii De Candolle, Syst. Nat. II. 9 (1821); Prodr. I. 106 (1824).—Hooker f., Bot. Mag. CVIII. t. 6646 (1882).—Keisuke Ito, Fig. Desc. Pl. in Kois. Bot. Gard. II. ed. Matsumura, t. IV, c. textu (1883).—André in Rev. Hort. 1894, 173, f. 66.—Sargent in Gard. & For. II. 52, f. 90 (1889).—Mouillefert, Traité Arb. I. 157, t. 3 (1891).—Saint-Paul in Mitt. Deutsch. Dendr. Ges. VIII. 1, tab. col. (1899).—Kawai in Bull. Coll. Agr. Tokyo, IV. 109, t. 9, fig. 18 (1900).—Shirasawa, Icon. Ess. For. Jap. II. t. 17, figs. 18–31 (1908).—Silva Tarouca & Schneider, Uns. Freiland-Laubg. ed. 2, 115, fig. 112 (1922).

B. cretica Thunberg, Fl. Jap. 146 (1784), non Linné.

B. Thunbergiana Schultes, Syst. Veg. VII. pt. 1, 6 (1829).

B. sinensis Koch in Ann. Mus. Lugd.-Bat. Bot. I. 252 (1864), excl. synon., non Desfontaines.

B. chinensis Franchet et Savatier, Enum. Pl. Jap. I. 22 (1875), non Poiret.

B. sinensis var. *angustifolia* Matsumura, Ind. Pl. Jap. pt. 2, 128 (1912), pro parte, non Regel.

Frutex latus, dense breviter ramosus, ad 1.5–2.5 m. altus; ramuli annotini fulvi, vivide rubescentes vel purpureo-rubri, biennes purpurei, glabri, valde angulato-sulcati, vetustiores nigrescentes vel cinerascentes; internodia 0.5–1 cm. longa; spinae pleraeque simplices, rarius 3-fidae, subtus haud vel vix sulcatae, 0.5–1.8 cm. longae, flavae, purpurascentes vel cinerascentes. Folia ad 8-fasciculata, valde inaequalia, matura crasse membranacea, ramulorum fertilium obovato-spathulata vel -oblonga, apice obtusa vel rotundata, rarius breviter acuta, mucronulata, basi satis subito vel sensim in petiolum 2–10 mm. longum contracta, 0.5–2 cm. petiolo excluso longa, 0.2–1.6 mm. lata, superne intense viridia, costa tenuiter incisa, nervis lateralibus paullo vel vix visibilibus, subtus pallide viridia vel albescentia, pruinosa et interdum sub microscopio papillosa (margines cellularum epidermidis utriusque faciei subaequimagnarum in pagina superiori rectae vel leviter undulatae, in pagina inferiori fere semper valde irregulariter undulatae); folia ramulos novellos fulcientia surculorumque aliis similia vel majora, ad 3.5 cm. petiolo excluso longa et ad 2 cm. lata, obovata vel elliptico-rhomboidea, petiolis 0.3–1 cm. longis. Inflorescentiae 1–5-florae, fasciculatae vel umbellato-subracemosae et breviter pedunculatae; pedicelli (5–)6–10 mm. longi, graciles, bracteis triangulari-lanceolatis acuminatis 1.5–2 mm. longis suffulti; flores flavi, extus rubescentes, 7–10 mm. diametientes; sepala externa prophylliformia parva triangularia vel ovata, media oblonga obtusa internis late obovatis vel ellipticis obtusis 5–6 mm. longis fere duplo minora; petala obovata vel obovato-oblonga, apice truncato-rotundata, leviter emarginata vel crenulata, basi paullo contracta, 6–6.5 mm. longa, glandulis 2 distinctis satis brevibus ovoideis aurantiacis praedita; stamina petalis $\frac{1}{3}$ breviora, apice obtusa vel fere leviter emarginata; ovarium satis crasse ellipticum, stigmate lato sessili, ovulis (1–)2, rarissime 3 sessilibus instructum. Fructus elliptici, circiter 10 mm. longi et 5–6 mm. crassi, rarius majores ad 12–13 : 7–8 mm. magni, corallini vel vivide purpurei, tarde decidui; semina 1–2, elliptico-oblonga, laevia, initio flavo-brunnea, deinde purpurescentia, (7–)8 mm. longa.

Berberis Thunbergii is a common plant in the central and southern parts of Japan, but apparently is not found in northern Hondo or in Hokkaido. De Candolle based the species on the type of Thunberg's *B. cretica*. It was introduced into cultivation by Maximowicz about 1865. Regel (in Gartenfl. XXI. 238 [1872]) states that the type and f. *Maximowiczii* were hardy at Petersburg. In Del. Sem. Hort. Petrop. it appears first in 1875, p. 23. The Arnold Arboretum received it from St. Petersburg in 1875 (no. 82). It came to Kew from Booth in 1874 (MSS. Cat. 1884, p. 9), and it was at Segrez in 1877. It is one of the best marked species by its dense habit, the deeply furrowed branches, the small spatulate entire leaves, the pale yellow flowers, and the shining red rather dry fruits that remain long on the shrubs. The autumnal color of the leaves is splendid. The following forms and varieties can be distinguished:

Berberis Thunbergii f. Maximowiczii, nov. f.

B. Maximowiczii Regel in Gartenfl. XXI. 238 (1872).

B. Thunbergii var. *Maximowiczii* Regel in Act. Hort. Bot. Petrop. II. 420 (1873).—Franchet et Savatier, Enum. Pl. Jap. II. 272 (1879).

A typo recedit foliis acutis vel rarius obtusis utrinque viridibus.—These characters are rather inconstant, and it is almost impossible to distinguish this form with certainty. In the Arnold Arboretum a plant (no. 4769) raised in 1901 from seeds from the Tokyo Botanic Garden seems best to represent this form.

Berberis Thunbergii f. argenteo-marginata, nov. f.

B. Thunbergii, "Silver Beauty," in Gard. Chron. ser. 3, XLIX. 10, fig. 10 (1911).

A typo recedit foliis margine argenteo-marginatis.—It originated in the Continental Nurseries of J. van Leeuven at Franklin, Mass.

Occasionally seedless forms can be found which might be named f. *asperma* with the same right as a f. *enuclea* is distinguished in *B. vulgaris*.

Berberis Thunbergii var. **minor** Rehder in Mitt. Deutsch. Dendr. Ges. XIII. 330 (1898).

B. Thunbergii var. *Dawsonii*, Bean, Trees & Shrubs Brit. Isles, I. 250 (1914).

A typo recedit habitu minore debiliore, foliis plerisque minoribus, floribus saepissime singulis et etiam fructibus saepe minoribus.—It is a form of very dense habit scarcely distinguishable from the type in the herbarium. I refer to it no. 4381 from the Arnold Arboretum which is said to have been raised from seeds of typical *B. Thunbergii*.

Berberis Thunbergii var. **pluriflora** Koehne ex Rehder in Mitt. Deutsch. Dendr. Ges. XIII. 33 (1898).

A typo praecipue recedit habitu minus dense ramoso, foliis saepe oblongioribus et longioribus majoribus ramulorum sterilium interdum ex parte graciliter serrulatis, inflorescentiis distincte racemosis ad 5.5 cm. longis 5–15-floris.

This form is known only in cultivated state. It is often regarded as a form of the hybrid *B. ottawensis* but plants like those cultivated at the Arboretum under no. 671 (partim) and no. 4576 show no influence of *B. vulgaris* at all. Extremely fine fruiting branches were collected by Sadler in Hort. Kohanke, Painville, Ohio, in October, 1916. The fruits are mostly coral-red as in the type, but there are a few dull red ones with a slight bloom that somewhat suggests *B. vulgaris*. If this variety should be of hybrid origin, too, it certainly represents a form of *B. ottawensis* that comes very near *B. Thunbergii*.

× **Berberis ottawensis** Schneider in Silva Tarouca & Schneider, Uns. Freiland-Laubg. ed. 2, 116 (1922), nomen seminudum.

Frutex patulo-rectus, habitu inter *B. vulgarem* et *B. Thunbergii* satis intermedia, circiter 0.6 ad 1.5 m. altus; ramuli annotini plus minusve brunnescentes vel flavo-brunnei, ut biennes flavo-cinerei sulcati, vetustio-

res cinerascentes; internodia 0.8 ad 1.5 cm. (vel surculorum ad 3.5) longa; spinae etiam surculorum satis debiles, parte superiore ramulorum simplices, parte inferiore pleraeque 3-fidae, flavo-brunneae vel flavescentes, mediae 3–8(–10), laterales vix ultra 5 mm. longae, subtus applanatae vel tenuiter sulcatae. Folia 2–6-fasciculata, valde inaequalia, matura membranacea, ramulorum fertilium oblanceolata, obovato-oblonga, subrhomboideo-obovato-oblonga vel obovato-elliptica, apice subacuta, obtusa vel subrotundata, tenuissime mucronulata, basim versus satis subito in petiolum 1–6 mm. longum attenuata, margine integerrima vel dentibus minimis paucis rarius pluribus vix ad 1 mm. longis instructa, angustiora petiolo incluso 15 : 6 ad 35 : 15 mm., latiora 20 : 11 ad 30 : 15 mm. magna, superne viridia, subtus pallidiora vel subpruinosa, satis laevia vel tenuiter reticulata; folia ramulorum sterilium surculorumque majora, saepissime latiora, ovato-, obovato- vel elliptico-oblonga, apice obtusa vel rotunda, basi acuta et subito in petiolum 1–6(–8) mm. longum contracta, margine satis distanter vel pleraque densius graciliter serrata serraturis vix ad 1 mm. longis, rarius subintegra. Inflorescentiae subumbellato-racemosae vel racemosae, 3- ad 15-florae, rariter (saltem versus apicem ramulorum) ut in *B. Thunbergii* uniflorae, pedicello nudo ad 2 cm. longo, excluso 1–3 cm. longae, patentes vel saepissime nutantes; pedicelli 4–6 mm. longi, apice leviter incrassati, bracteis lanceolatis acuminatis 1.5 ad 2 mm. longis suffulti; flores lutei (sepalis externis vel prophyllis saepe rubescentibus), 6–7 mm. diametientes, sepala externa vel prophylla bracteiformia, media ovato- vel obovato-oblonga 3–4 mm. longa quam petala pallidiora; petala ovato-elliptica vel obovato-oblonga, apice integra, 4–5 mm. longa, basi glandulis satis aurantiacis distinctis praedita; stamina petalis ¼ breviora, apice truncata; ovaria elliptico-oblonga, ovulis 2 sessilibus. Fructus (no. 3 ex Ottawa) circiter 9 mm. longi et 5 mm. crassi, ellipsoidei, fere ut in *B. Thunbergii* colorati, stigmate sessili coronati; semen plerumque 1, circiter 6 mm. longum, purpureo-brunneum, minutissime punctulatum.

This hybrid has been observed in different gardens. It has been raised artificially by Dr. Charles Saunders in the gardens of the Experimental Station at Ottawa, Canada, from which Dr. Macoun sent me material of different forms of this cross under numbers 1 to 11 in June, 1917. In this case one of the parents has been *B. vulgaris* f. *atropurpurea*. The first mention of a possible hybrid between *B. Thunbergii* and *B. vulgaris* I find in a note from Professor Jack in Garden and Forest, II. 272 (1889). This note runs as follows: "A curious and beautiful Barberry now in flower here is not referable to any described species, while some of its characters suggest a possible hybrid between *B. vulgaris* and *B. Thunbergii*. It has the bark upon the branches of *B. vulgaris*, the simple, slender spines of *B. Thunbergii*, the tufted, entire obovate leaves of this last species. They are considerably larger, however, paler green, more membranaceous, and borne on long slender petioles. The flowers are produced in long-stalked (sometimes nearly an inch long), umbellate racemes, of eight or ten or sometimes

only of three or four flowers. They are larger than those of *B. Thunbergii*, bright yellow (those of *B. Thunbergii* are much paler), with rounded sepals and petals, and the red-marked filaments of the Japanese plant. They open a week or ten days later than those of *B. vulgaris*, and possess a trace merely of the delightful fragrance of those of this species. The fruit resembles very closely that of *B. Thunbergii*, and hangs, as it is the case with that plant, bright and fresh upon the branches throughout the winter and early spring. Several years ago, Max Leichtlin sent to the Arboretum seeds of 'two red-fruited' Barberries, without any indication of their origin. A large proportion of the seedlings raised from this seed proved to be *B. Thunbergii*, but among them were several individuals of this peculiar plant, which suggests in its umbellate inflorescence some of the forms of the sub-evergreen of *B. aristata* of the Himalayas. But whether, as I suspect, it is a hybrid, or some species unknown here, it is an exceedingly ornamental and valuable garden plant; one of the neatest of the whole genus in its habit of growth, perfectly hardy, and very beautiful when its graceful branches are covered with its nodding umbels of large, bright-colored flowers." This is an excellent description of our hybrid. I have seen several specimens in the Arnold Arboretum under no. 671 and 671–2. There are apparently at least two or three distinct forms of this hybrid. One has the leaves partly tinged with purple according to the fact already mentioned that f. *atropurpurea* of *vulgaris* was one of the parents. Whether var. *pluriflora* of *B. Thunbergii* has to be regarded as a form of the hybrid, too, or a mere variety of *Thunbergii* remains to be seen. There are certainly forms which very closely approach either the one or the other of the parent very closely.

I will add an enumeration and description of *Berberis vulgaris* and its forms.

Berberis vulgaris Linnaeus, Spec. i. 330 (1753).—J. S. Kerner, Beschreib. Abb. Bäume Sträucher, 84, t. 32 (1787).—Reitter et Abel, Abb. Deutsch. Holzart. 20, t. 49 (1790).—Sowerby, Engl. Bot. i. t. 49 (1790).—Schkuhr, Bot. Handb. i. 306, t. 99 (1791).—Vahl, Fl. Dan. vi. 3, t. 904 (1792).—Palmstruch et Venus, Svensk Bot. i. t. 24 (1802).—Hayne, Darst. Arzeneigew. i. 41, t. 41 (1805).—Schrank, Fl. Monac. i. t. 78 (1811).—Bigelow. Fl. Boston, 78 (1914).—Nees v. Esenbeck, Pl. Med. ii. t. 368 (1828).—Poiteau & Turpin in Duhamel Traité Arb. Fruit., n. ed. iii. 51 t. 51 (1835).—Baxter, British Phaen. Bot. ii. t. 115 (1835).—D. Dietrich, Forstfl. ed. 2, 81, t. c. (1838).—Reichenbach, Ic. Fl. Germ. Helv. iii. 3, t. 18, fig. 4486 (1838).—Audubon, Birds Am. iii. 87, t. 166 (1841).—A. Dietrich, Fl. Reg. Boruss, x. t. 685 (1842).—Seringe, Fl. Jard. iii. 257, t. 4, figs. 1–13 (1849).—Sturm, Deutschl. Fl. Abt. i. Bd. xx. t. 9312 (1849).—Böck, Naturg. Abb. Deutschl. wilde Holzart. 46, t. 60 (1859).—Sowerby, Engl. Bot. ed. 3, i. 71, t. 51 (1863).—Baillon, Hist. Pl. iii. 50, figs. 49–55 (1872).—Hallier, Deutschl. Fl. ed. 9, 104, t. 25

(1873/5).—Lange, Arb. Scand. III. t. 102 (1883).—Thomé, Fl. Deutschl. II. 96, t. 299 (1887).—Millspaugh, Am. Med. Pl. I. 15, t. 15 (1887).—Perrin and Boulger, Brit. Fl. Pl. II. t. 83 (1914).

B. vulgaris, sive *Crespinus* Camerarius, De Pl. Epit. Util. P. A. Matthioli 86, c. icone (1536).

B. maximo fructu Gerard, Catal. Arb. 4 (1599).

Berberis Gesner, Hort. Germ. in Cordus, Annot. Pedac. Discor. Libr. 250 (1561).—M. Hoffmann, Fl. Altdorf. Del. Sylv. [11] (1662).—Haller, Enum. Pl. Hort. Gott. 171 (1753).

B. vulgaris Belon, De Negl. Stirp. Cult. 41, lin. 12 (1589).—Clusius, Rar. Pl. Hist. 120, c. icone (1601).

Spina acida, sive *oxyacantha* Dodonaeus, Stirp. Hist. Pemptad. 750, c. icone (1616).

B. officinarum Dalechamps, Hist. Gen. Pl. 137, c. icone (1587).

B. dumetorum C. Bauhin, Pinax 454 (1623).

B. fructu rubro Bobart, Cat. Pl. Hort. Med. Oxon. 9 (1648).

Berberis P. G. 561 spina acida, sive oxyacantha Stephens & Brown, Cat. Hort. Bot. Oxon. 29 (1658).

B. oxyacantha Cat. Pl. Schol. Bot. Hort. Reg. Paris, 54 (1660).

B. s. oxyacantha Galeni M. T. Titius, Cat. Pl. Hort. Elect. Regiom. (1654), ex Linn. x. 375 (1836).

B. vulgo quae & oxyacantha putata P. Magnol., Hort. Reg. Monspeliensis 22 (1697).

Oxyacantha Galeni etc. (*Berberis officinarum* in indice) Besler, Hort. Eystet. 9, t. 9, f. III (1713).

B. spinis triplicibus Linnaeus, Hort. Cliff. 122 (1737); Fl. Suec. 104. No. 290 (1745).

B. pedunculis racemosis Linnaeus, Mat. Med. 57. No. 170 (1749).—Miller, Gard. Dict. ed. 7, No. 1 (1764).

B. dumetorum Miller, Fig. Pl. I. 42, t. 63 (1760).—Gouan, Fl. Monspel. 312 (1765).—Duhamel, Traité Arb., I. 97, t. 38 (1755); Traité Arb. Fruit. I. 149, t. 152 (1768).—Dict. Pl. Us. Arb. III. 251, t. c. 3 (vel 264) (1793).

B. racemifera, foliis ciliatis Haller, Hist. Stirp. Helv. 360 (1768).

B. officinarum Gleditsch, Pflanzenverz. 57 (1773).

B. vulgaris rubra Aiton, Hort. Kew. I. 479 (1789).

B. acida Gilibert, Exerc. Phyt. I. 284 (1792).

B. irritabilis Salisbury, Prodr. 213 (1796).

B. racemosa rubra Stokes, Bot. Mat. Med. II. 296 (1812).

B. articulata Loiseleur-Deslongchamps in Dict. Sci. Nat. LVIII. 218 (1829), descr. plant. juven.

B. serrulata Rafinesque, Silva Tellur. 68 (1838).

B. vulgaris heterophylla Wierzbicki in Reichenbach, Icon. Fl. Germ. III. 3, t. 18, f. 4486 partim (1838), sec. specim. orig.

B. vulgaris var. *obovato-oblonga* Schrader in Linnaea, XII. 366 (1838).

B. vulgaris arborescens Koch, Hort. Dendr. 17 (1853).

B. vulgaris n. *B. microphylla* Koch in Wochenschr. Ver. Bef. Gartenb. Preuss. IV. 75 (1861).

B. vulgaris p. *B. vulgaris oblongata* Koch, l. c. 76.

B. vulgaris q. *B. arborescens* Koch, l. c. 76.

B. speciosa Hort. ex Koch, l. c. 76 (1861), pro synon.

B. vulgaris var. *arborescens* Jaeger, Ziergeh. 127 (1864).

B. vulgaris var. *serotina* Jaeger, l. c., non Schrader.

B. vulgaris var. *speciosa* Jaeger, l. c.

B. arborescens Hort. ex Koch, Dendr. I. 393 (1869), pro synon.

B. vulgaris normalis a. *typica* Regel in Act. Hort. Bot. Petrop. II. 411 (1873), exclud. synon. pro parte.

B. vulgaris a. *normalis* Dippel, Handb. Laubholzk. III. 114 (1893), exclud. syn.

B. vulgaris d. *canadensis* Dippel, l. c. 115, p. p. m., non Aiton.

B. vulgaris var. *typica* Fiori in Fiori & Paoletti, Fl. Anal. Ital. 529, fig. 1641 (1898).

B. vulgaris var. *typica* f. *subrotunda* Schneider in Bull. Herb. Boiss. sér. 2, VIII. 668 (1905).
B. vulgaris subspec. *euvulgaris* Briquet, Prodr. Fl. Cors. I. 639 (1910).
B. actinocarpa Hort. ex Hort. Kew. 1880.
B. microphylla Hort., ex parte.
B. sanguinolenta Hort., ex parte, non Schrader.
B. vulgaris maxima Hort. ex Hort. Kew. 1880.

Of the garden forms of *B. vulgaris* the following should be mentioned:

Berberis vulgaris f. **albospicata** Bean, Trees & Shrubs Brit. Isles, 252 (1914).

A typo ex auctore recedit innovationibus foliisque juvenilibus lacteis. Bean says: "Young shoots and leaves creamy white." Probably this is only a subform of f. *albo-variegata*.

Berberis vulgaris f. **argenteo-marginata** Usteri in Mitt. Deutsch. Dendr. Ges. VIII. 93 (1899).

? *B. vulgaris fol. variegatis* Schultes in Roemer et Schultes, Linn. Syst. Veg. pt. I. 2 (1829).—Kirchner in Petzold & Kirchner, Arb. Musc. 137 (1864).
B. vulgaris fol. argenteo-variegatis Koch, Hort. Dendr. 17 (1853).
B. vulgaris 4c. *marginata* O. Kuntze, Taschenfl. Leipz. 170 (1867), pro parte.—Salomon, Deutschl. Winterh. Baeume, 110 (1884).
B. vulgaris α. *normalis* k. *marginata* Regel in Act. Hort. Petrop. II. 412 (1871).
B. vulgaris normalis albo-variegata Zabel in Beissner, Schelle & Zabel, Handb. Laubh.-Ben. 111 (1903).
B. vulgaris typica f. *albi-marginata* et f. *albi-variegata* Voss in Putlitz et Meyer Landlex. v. 709 (1913).
B. vulgaris var. *albo-variegata* Rehder in Bailey, Stand. Cycl. Hort. I. 489 (1914).

A typo recedit foliis saepe satis parvis albo-variegatis vel albo-marginatis.—To this form belong all the forms with white-variegated leaves. Schultes' form "fol. variegatis" is quite uncertain, This is the case, too, with *B. vulgaris* var. *variegata* Hort. ex Jacques et Herincq, Man. I. 52 (1847). None of these authors states whether the variegation of the leaves is whitish or yellow. Kirchner does not say where he got his form from, stating only: "Eine kleinblättrige Spielart, deren Blätter weiss gestreift sind."

B. vulgaris f. **atropurpurea** Regel in Gartenfl. IX. 2, t. c. 278, f. 1 (1860).
B. vulgaris var. *purpurea* Bertin in Jacques & Herincq, Man. Pl. Arb. I. 52 (1847), non De Candolle.
B. vulgaris foliis purpureis Koch, Hort. Dendr. 17 (1853).
B. vulgaris o. *B. purpurea* Koch in Wochenschr. Ver. Bef. Gartenb. Preuss. IV. 75 (1861).
B. vulgaris α. *normalis* n. *atropurpurea* Regel in Act. Hort. Petrop. II. 412 (1873).
B. vulgaris g. *B. atropurpurea* Lauche, Deutsche Dendr. 367 (1880).
B. vulgaris f. *foliis atropurpureis* Schuebeler, Virid. Norveg. II. 295 (1880).

This is the finest of all the garden forms of *B. vulgaris*. It was first described by Jacques et Herincq, l. c., as follows: "*B. vulgaris* var. *purpurea* Bertin. Cet arbuste obtenu, il y a quelques années, de semis par Bertin, à Versailles, diffère de l'ésp. par son feuil. pourpre-foncé, ainsi que

la face interne des sepales." The name *purpurea* has however already been used for another form. This variety is one of the parents of *B. ottawensis* (see above). The young shoots, too, are often somewhat purplish.

B. vulgaris f. **aureo-marginata** Salomon, Deutsche Baeume Straeuch. 110 (1884).

B. vulgaris v. 3 *foliis aureo-marginatis* Kirchner in Petzold et Kirchner, Arb. Muse. 137 (1864).
B. vulgaris v. *marginata aurea* Jäger, Zierg. 127 (1865).
B. vulgaris 4e. *marginata* O. Kuntze, Tasch.-Fl. Leipz. 170 (1867), pro parte.
B. vulgaris normalis 1. *aureo-marginata* Regel in Act. Hort. Petrop. II. 412 (1873).
? *B. vulgaris* z. *normalis* m. *aurea* Regel, l. c., non *B. vulgaris aurea* Jäger (1865).
? *B. vulgaris* v. *ovalifolia aurea* Lavallée, Arb. Segrez. 12 (1877).
B. vulgaris forma *B. aurea* Lauche, Deutsch. Dendr. 367 (1880).
B. vulgaris a. *B. marginata* Mouillefert, Trait. Arb. I. 145 (1891).
B. vulgaris variegata Nicholson in Garden, XXXV. 265 (1889).—Bean, Trees a. Shrubs Brit. Isles, I. 252 (1914).
B. vulgaris aurea Hartwig, Ill. Gehölzb. 74 (1892).
B. vulgaris v. *typica* f. *aureo-marginata* Voss in Putlitz & Meyer, Landlex. v. 708 (1913).

The origin of the yellow-variegated form seems to be unknown. Kirchner says: "Eine Spielart mit grossen, rundlichen, gelbumsäumten Blättern, die wir unter obigem Namen aus den Flottbecker Baumschulen erhielten. Ob dies dieselbe Form ist, die Prof. Koch (Wochenschrift IV. 94) als *B. marginata* zu *B. canadensis* Prsh. zieht, vermögen wir nicht zu sagen." *B. vulgaris aurea* Jäger, Ziergehölze 127 (1865), refers to the color of the flowers, and Jäger probably had the doubtful *B. aurea* of Tausch in mind.

B. vulgaris f. **Egbertii** Schneider, c. n.—*B. purpurea Egbertii* Hort. ex Gibbs in Jour. R. Hort. Soc. XXXIII. 348 (1908).—I know this form only from the following statement of Gibbs: "The purple leaves are faintly striped or powdered with white." It may be only a subform of f. *atropurpurea*.

B. vulgaris f. **lucida** Gordon in Loudon, Gard. Mag. n. s. VI. 2 (1840).

B. lucida Schrader in Linnaea, XII. 363 (1838).—Schneider in Mitt. Deutsch. Dendr. Ges. XV. 175 (1907).
B. vulgaris a. *B. lucida* Koch in Wochenschr. Ver. Bef. Gartenb. Preuss. IV. 75 (1861).

Schrader says as to the origin: "Hab. in Iberia." I have seen his type, and I know of no form from Iberia or western Asia that might be even compared with it. According to the type and Schrader's own description *B. lucida* is nothing but a form of *B. vulgaris*. There is no character pointing to any hybrid influence. Specimens from Kew, collected on May 11, 1880 and August 11, 1882 differ from typical *B. vulgaris* only by their smaller fruits which measure scarcely up to 7 mm. in length. What I know under the name of *B. lucida* in our gardens has purple shoots and has nothing to do with Schrader's true form.

B. vulgaris f. alba Weston, Bot. Univ. I. 20 (1770); Fl. Angl. 4 (1775).—De Candolle, Syst. Nat. II. 6 (1821).

Berberis dumetorum fructu candido Miller, Cat. Trees Pl. Lond. 12 (1730).
Berberis fructu albo Miller, Gard. Dict. no. 4 (1731).
B. vulgaris forma fructu albo Miller, l. c. ed. 8, no. 1 (1768).
B. alba Poiteau et Turpin in Duhamel, Traité Arb. Fruit n. ed. III. 52, t. c. 52 (1835).
B. vulgaris flava Schrader in Linnaea, XII. 364 (1838).
B. vulgaris fructu albo Kirchner, Arb. Muse. 137 (1864).
B. vulgaris 1c. *leucocarpa* O. Kuntze, Tasch.-Fl. Leipz. 170 (1867).
B. vulgaris α. *normalis* f. *leucocarpa* Regel in Act. Hort. Petrop. II. 412 (1873).

A typo ex auctoribus nonnisi colore lacteo (haud distincte albo) recedit.

I have never met with this form in gardens. Poiteau et Turpin say that the fruits are "d'un blanc jaunatre," and "cette espèce est rare dans les jardins, probablement parcequ'elle ne produit que très peu de fleurs et presque point de fruits."

B. vulgaris f. dulcis Loudon, Arb. Brit. III. 301 (1838).—Endlicher, Cat. Hort. Acad. Vindob. I. 230 (1843).

B. vulgaris fructu dulci Schultes, Syst. Veg. VII. pt. 2 (1829).
B. dulcis Hort. Angl. ex Schrader in Linnaea, XII. 374 (1838), non Sweet.
B. vulgaris f. *B. mitis* Koch in Wochenschr. Ver. Gartenb. Preuss. IV. 75. (1861), non *B. mitis* Schrader.
B. vulgaris v. *edulis* et var. *mitis* Jäger, Zierg. 127 (1865).
B. vulgaris 2b. *glycycarpa* O. Kuntze, Tasch.-Fl. Leipz. 170 (1867).
B. vulgaris normalis c. *edulis* Regel in Act. Hort. Petrop. II. 411 (1873).
B. esculenta Hort. ex Kirchner in Petzold & Kirchner, Arb. Muse. 133 (1864).

A typo nonnisi fructibus vix acidulis recedit.

According to a note in Trans. Hort. Soc. IV. 407 (1822), this form has been detected by H. Schott in the Austrian Alps as Jacquin wrote in a letter addressed to the Horticultural Society of London received on February 8, 1820. Endlicher cites var. *dulcis* "Host." Host, however, in his Fl. Austr. I. 454 (1827) only says: "Inveniuntur in Austria inferiore prope Gutenstein individua fructus dulces ferentia.

B. vulgaris f. enuclea Weston, Fl. Angl. 4 (1775).—Reichert, Hort. Reich. 3 (1804).

B. sine acinis Gerard, Cat. Arbor. 4 (1599).
Berberis 'κοπορος Clusius, Hist. I. 121 (1601).
B. sine nucleo C. Bauhin, Pinax. 454 (1623).
B. dumetorum sine nucleo Miller, Cat. Trees Pl. Lond. 12 (1730).
B. vulgaris sine nucleo Weston, Bot. Univ. I. 20 (1770).
B. vulgaris f. *asperma* Willdenow, Berl. Baumz. 34 (1796).
B. abortiva Renault, Fl. Dep. Orne 179 (1804).
B. vulgaris var. *sterilis* Desfontaines, Hist. Arb. II. 27 (1809).
B. vulgaris apyrena Schrader in Linnaea, XII. 364 (1838).
B. vulgaris 3b. *degener* O. Kuntze, Tasch.-Fl. Leipz. 170 (1867).

A typo nonnihil differt fructibus omnibus vel pro parte aspermis.

This is the oldest garden form of which Clusius (1601) says: "Istius porro Berberis genus, Aschafenburgi ad Moenum quinis supra Francofurtum miliaribus, inveniri, cujus baccae sive acini granis interioribus careant, ad condiendum procul dubio aptissimi, non modo intelligebam,

sed manu ejus fruticem in culto horto Ioannis Müler diligentissimi Pharmacopaei et civis Francofurtensis conspiciebam." Duhamel, Traité Arb. Fruit. I. 151 (1768) states: "Cette variété se trouve dans la forêt de Lions (Lyons) dans plusieurs endroits du Vexin Normand et des environs de Rouen. Les confitures d'Épine-vinette sans pepin qui se font dans cette ville sont fort connues." Young plants produce at first fruits with seeds as already observed by Miller, Duhamel and Loudon, of the old plants the fruits become seedless. Sometimes such a form may be observed of other species, too.

B. vulgaris f. **lutea** L'Héritier apud De Candolle, Syst. Nat. II. 6 (1821).
B. vulgaris flava Heynold, Nomel. Bot. Hort. 118 (1840), fide II. 55 (1846).
B. vulgaris normalis xanthocarpa Zabel in Beissner, Schelle, Zabel, Handb. Laubhb. 111 (1903).

A typo nonnisi fructibus luteis flavisve differt.

The fresh fruits are of a beautiful yellow. This form may be connected by intermediate forms with f. *alba*.

B. vulgaris f. **microcarpa** Schrader in Linnaea, XII. 366 (1838).
B. silvestris Poiteau & Turpin in Duhamel, Traité Arb. Fruit. n. ed. III, 15*, t. 15 (1835).
? *B. vulgaris* h. *B. Jacquinii* Schrader ex Koch in Wochenschr. Ver. Bef. Gartenb. Preuss. IV. 75 (1861).

A typo ex auctore differt baccis minoribus subgloboso-ellipticis; *B. silvestris* ex auctoribus et icone praecipue fructu parvo obovato distincta esse dicitur, probabiliter ab varietatibus duobus alteris citatis non est diversa.

I take as the type of this form *B. silvestris* of Poiteau & Turpin who say: "Celle-ci, plus petite dans toutes ses parties, est la moins connue et la moins cultivée, sans doute à cause de la petitesse de ses fruits. Nous en devons la connaissance à M. Noisette qui, le premier, l'a distinguée dans son école." Noisette does not mention this form in Man. Comp. Jard. II. 579 (1825). Koch says (Dendr. I. 394 [1869] that he found as *B. Jacquinii* in the gardens a form with small roundish-elongate fruits that may be a cross with *B. canadensis*. In this case it ought to be referred to *B. declinata*. See also below under f. *macrocarpa*.

B. vulgaris f. **macrocarpa** Jäger, Ziergeh. 127 (1865).
B. vulgaris fructu maximo Hornemann, Hort. Bot. Hafn. I. 348 (1813).
B. latifolia Poiteau et Turpin in Duhamel, Traité Arb. Fruit. n. ed. III. 60 (1836), non Ruiz et Pavon.
? *B. vulgaris* v. *speciosa*, var. *serotina* et var. *macrocarpa* Schrader in Linnaea, XII. 365 et 370 (1838).
B. monspeliensis Hort. ex Lavallée, Arb. Segr. 12 (1877), pro synon.

A typo ex auctoribus fructibus majoribus differt. *B. latifolia* ex auctoribus et icone foliis et fructibus majoribus diversa est. Var. *serotina* ex auctore baccas miniato-coccineas habet et forma a Duhamel picta haud dissimilis esse sed fructus colore differre dicitur.

The origin of this form is unknown, it is probably nothing but a form with larger fruits once used to make sweets in France.

B. vulgaris f. **violacea** Willdenow, Berlin. Baumz. 34 (1796).

B. violacea Poiteau & Turpin in Duhamel, Traité Arb. Fruit. n. ed. III. 52, t. 59 (1835).
? *B. vulgaris sanguinea* Schrader in Linnaea, XII. 364 (1838).
B. vulgaris à fruit violet Spach, Hist. Vég. VIII. 40 (1839).
B. coerulea Hort. ex Jacques & Herincq, Man. I. 52 (1847), pro synon.
B. vulgaris 1b. *cyanocarpa* O. Kuntze, Tasch.-Fl. Leipzig, 170 (1867).
B. sanguinea K. Koch, Dendr. I. 394 (1869), pro synon.
B. sanguinolenta Hort., ex Koch l. c., non Schrader.

A typo ex auctoribus nonnisi fructibus "violaceis" differt.

Judging by the plate in Poiteau & Turpin's Duhamel it might be a hybrid between *vulgaris* and *chinensis*, but it is doubtful whether the last species has already been in cultivation in 1796 when Willdenow described this form. He says nothing but: "hat vielmahl geteilte Stacheln und dunkelviolette Früchte." Probably it is a form of *vulgaris* with slightly violet fruits. Schrader in Linnaea XII. 366 (1838) in speaking of the "Var. dubiae" says: "Baccae vere violaceae in nulla violacea Hort. unquam mihi visae, nec tales refert B. violaceo fructu Duh. Arb. Frut. t. 59.—Procul dubio ad aliam aff. sp. referenda est." Specimens named *vulgaris violacea* from Kew (May 11, 1880, and August 11, 1882, no. 673) were mixed with flowering branches of *B. Thunbergii*. Otherwise the flowering branches were very similar to those of *B. vulgaris*, but the fruits were very small, hardly up to 8 mm. long, and somewhat obovoid, much resembling those of var. *microcarpa*.

The following garden forms I have not been able to elucidate:

B. vulgaris 9. *longifolia* Booth apud Loudon, Encycl. Trees 43 (1842).—"Leaves longer than those of the species."

B. vulgaris 10. *glauca* Loudon, l. c.—*B. glauca* Booth ex Loudon, l. c.—*B.* (?*iberica*) *glauca* Booth ex Gordon in Loudon, The Gard. Mag. n. s. VI. 2 (1840).—Gordon says: "This is a distinct but rather slender plant, with small very glaucous leaves, and is nearly related to *B. iberica*, it was received from Messrs. Booth at Hamburg, but it is in other collections under the incorrect name *B. ilicifolia*." Loudon (1842) says: "Mr. Gordon considers this plant as related to *B. sibirica* (sic!); but as it has not yet flowered in the Horticultural Society's Garden this point cannot be determined.

B. vulgaris 11. *mitis* Loudon, l. c. 43 (1842).—"Shoots without spines. Leaves glaucous, rather broader."

B. vulgaris 7. *rotundifolia* Kirchner, Arb. Musc. 138 (1864).—"Eine Form mit mehr rundlichen Blättern."

B. vulgaris var. *rotunda* Jäger, Zierg. 127 (1865).—"Mit runder Frucht."

B. vulgaris var. *cuneata* Hort. ex Lavallée, Arb. Segr. 12 (1877), nom. nud.

B. vulgaris var. *parvifolia* Regel in Act. Hort. Petrop. II. 413 (1872).—*B. cretica* Hort. ex Regel, l. c.—*B. vulgaris* c. *B. brachybotrys* Koch Dendr. I. 396 (1869).—*B. vulgaris* c. *brachybotrys* Koch ex Regel, l. c., pro synon.

B. vulgaris commutata Regel, l. c. 413.—A form with a very mixed synonymy comprising partly forms of *vulgaris* from North America, partly probably of true *canadensis*, partly very uncertain forms.

B. vulgaris var. *virgata* Hort. ex Zabel in Verz. Münd. 6 (1878), nom. nud.

B. vulgaris u. *B. antinocarpus* Hort. ex Mouillefert, Traité Arb. Arbriss. I. 147 (1891).—"Ne diffère pas sensiblement du type."

During the last ten years some extremely interesting and valuable hybrids have been raised by the late Dr. van Fleet in his garden at Bell Station, Maryland. Dr. van Fleet who was one of the most skillful of American plant breeders was kind enough to send me some material in 1916. On April 26, 1919, I had the opportunity to pay a visit to Bell where I saw a good many more hybrids, and received information and material from Dr. van Fleet himself. I intended to make a thorough study of all these forms, but owing to my departure for Europe in September, 1919, I have not been able to collect more material at Bell, and complete my observations. At present I cannot do more than mention the crosses of which I have seen the plants and of which I possess at least some sterile or flowering material in my herbarium. I can only hope that after the death of Dr. van Fleet these plants were not lost. Somebody else may be able to look them over, and to give full descriptions of them based on copious flowering and fruiting material. There are among these hybrids some plants of high value. The best, so far as I have seen, is the following, which I want to name in honor of its raiser.

× **B. Vanfleetii,** hybr. nov. (*B. Veitchii* × *vulgaris*).

Frutex compactus ad 1.5 m. altus ramis squarrosis paullo dependentibus; ramuli annotini obscure brunnescentes subangulati, biennes pallide flavescentes minutissime pustulati, fere cylindrici, vetustiores cinerascentes; internodia 1.5–2 cm. longa; spinae satis evolutae, 3-fidae, flavescentes, subtus sulcatae, mediae ad 2.5 cm. longae, lateralibus paullo longiores. Folia subsempervirentia, 3–4-fasciculata, matura crasse chartacea vel subcoriacea, elliptica vel obovato-elliptica apice acuta, basi in petiolum subnullum vel ad 5 mm. longum contracta, margine subsinuato-spinoso-serrata dentibus gracilibus utrinque circiter 8–12 ad 1.5 mm. longis minimis exceptis ad 3.5–1.4 cm. magna, superne saturate viridia, subtus pallida, pruinosa, utraque facie laxe elevato-reticulata. Inflorescentiae breviter umbellato-racemosae floribus singulis additis, 4–9-florae, ad 2.5 cm. longae; pedicelli graciles, superiores circ. 5 mm. infimi ad 10 mm. longi, bracteis parvis triangularibus acutis acuminatisve 1–1.5 mm. longis; flores lutei, aperti ad 6–7 mm. diametientes. Fructus elliptici, circiter 8–10 : 6 mm. magni, estylares, cerasini, leviter pruinosi; semina 4, atro-purpurea, circiter 7 mm. longa, laevia.

This hybrid which is almost evergreen has proved much hardier than *B. Veitchii* Schneider (*B. acuminata* Veitch, non Franchet), hardy only in the warmer parts of the United States and Central Europe. *B. Vanfleetii* deserves the attention of all gardeners. The leaves are in part more like those of *B. vulgaris* than of *B. Veitchii*, and often show a very fine serration. The plant needs further observation, and probably some different forms may be raised from its seeds; I already have some material of the second generation which comes much nearer to *B. vulgaris*.

Very different looks another hybrid of *B. Veitchii* with *B. Poiretii* of which I collected flowering specimens at Bell on April 26, 1919. It seems to be a rather remarkable plant but I do not yet want to describe it, as the material I have is too scanty.

Dr. van Fleet made two other crosses of *B. Veitchii:* with *B. verruculosa* Hemsl. & Wilson and with *B. pruinosa* Franch. Of both he had only small plants when I was at Bell, but *B. Veitchii* × *pruinosa* had already flowered.

B. pruinosa had also been crossed with *B. Sargentii* Schneid.

I collected flowering specimens, too, from two hybrids of *B. Thunbergii:* one with *B. Rehderiana* Schneid. and a second one of which *B. Fendleri* Gray is said to be the other parent. Both need further observations.

The last hybrid I wish to deal with in my present note is a possible cross between *B. pruinosa* and *B. diaphana* Maxim. for which I propose the following name:

× **B. Vilmorinii,** hybr. nov.

Frutex satis crasse ramosus; ramuli annotini flavo-brunnei, sulcato-angulati, glabri; biennes flavo-cinerei, vetustiores cinerascentes; internodia 1–2.5 cm. longa; spinae 3-fidae, flavo-brunneae, patentes, mediae 1–2 cm. longae, subtus sulcatae, lateralibus paullo longiorbus. Folia 3–5-fasciculata, inaequalia, matura crasse chartacea vel subcoriacea, elliptica, ovato-elliptica vel oblongo-elliptica, apice acuta spinulosa, basi in petiolum subnullum contracta, margine argute spinoso-serrata serraturis utrinque 6–12 aristatis 1.5–2.5 mm. longis, 2–5 cm. longa, 0.8–2 cm. lata, superne saturate viridia, subtus glauca vel albo-viridia, pruinosa, haud vel vix papillosa. Inflorescentiae visae 1-florae; pedicelli ad 2 cm. longi, rubescentes; flores lutei?, circiter 9–10 mm. diametientes?, sepala externa vel prophylla non visa, media late ovata, internis late obovato-ellipticis rotundatis ad 8 mm. longis fere duplo minora; petala late obovata, ad 7 mm. longa, emarginata, basi breviter unguiculata glandulis 2 ovoideis mediocribus aurantiacis separatis praedita; stamina petalis fere duplo breviora, apice distincte apiculata; ovarium ovato-ellipticum, stigmate satis lato, ovulis circiter (5–)7–8 sessilibus. Fructus nondum maturi elliptici, circiter 11 : 5 mm. magni, ut videtur atrocerasini; stigmate subsessili; semina 1–2, nondum perfecte matura.

I received in the autumn of 1916 this peculiar form through the kindness of Mr. M. L. de Vilmorin. He sent me three specimens. One which I regard as the type had been collected in his Fruticetum (Les Barres) on Sept. 21, 1910 ("no. 1008 Y, Berberis du 30.3.05"). It has almost ripe fruits. The second specimen was collected on May 10, 1908 ("Berberis du 30 Mars 1905"); a flowering specimen of the fruiting plant. The third is sterile, collected on Sept. 13, 1916 ("Berberis from Verrières, ? Garden origin").

This form represents apparently a cross between the evergreen *B. pruinosa* Franch., and the deciduous *B. diaphana* Maxim. In its angular twigs, slightly dentate leaves, and in its numerous ovules this hybrid comes nearer *B. diaphana*, but the less veined leaves, the apparently more vigorous growth, the more robust spines, the smaller flowers and the fruits clearly indicate the influence of *B. pruinosa*. From the Kew Arboretum I saw a specimen collected in October, 1916 and bearing the name *B. vulgaris divaricata* that looks much like this hybrid. I wish to name this form in honor of the late Mr. Maurice L. de Vilmorin to whom I am under such great obligations for all the assistance he has given me during my dendrological studies.

BERLIN-DAHLEM, *June*, 1923.

THE HORTENSIAS
HYDRANGEA MACROPHYLLA DC. AND HYDRANGEA SERRATA DC.

Ernest H. Wilson

The flower-loving peoples of China and Japan have cultivated in their gardens from time immemorial a number of plants beautiful for their flowers, foliage, or habit of growth. In the early intercourse of western nations with the Orient it was these that were carried to Europe and many of them have become the most familiar and most prized of our garden plants. The origin of many of these plants is still obscure, though in recent years several have been discovered growing wild in the interior parts of China and Japan. During the twenty years which I have devoted largely to the investigation of the flora of eastern Asia I have taken much interest in the problem of these long-cultivated plants. It has been my good fortune to elucidate the origin of a number including the China Monthly Rose, the Tea Rose, several Azaleas, the Chinese Pear, Apple, Cherry and others including the subject of this note.

There is no more familiar plant in the gardens and greenhouses of this country and of Europe than the so-called Hortensias. These Hydrangeas have been long cultivated in the West and in the hands of the plant-breeders, principally those of France, have given rise to a wonderfully varied group of valuable decorative plants. It was Thunberg, in 1784, who gave the first binominal names to these Hydrangeas but he referred them wrongly to the genus Viburnum. Other botanists at later dates have given them other names. To clear up the synonymy it was necessary to know exactly what the plants were that Thunberg named in his Flora Japonica. In order to accomplish this I wrote to Professor H. O. Juel at Upsala who most courteously had made a set of fine photographic prints of Thunberg's specimens. The material in Thunberg's herbarium consists of these seven specimens:

Viburnum macrophyllum α. = Hydrangea macrophylla DC.
Viburnum macrophyllum β. = Hydrangea macrophylla DC.
Viburnum serratum α. = Hydrangea serrata var. stellata Wils.
Viburnum serratum β. = Hydrangea macrophylla DC.
Viburnum serratum γ. = Hydrangea serrata DC.
Viburnum serratum δ. = Hydrangea serrata DC.
Viburnum serratum ε. = Hydrangea serrata DC.

The first-named, *Viburnum macrophyllum*, is the familiar Hydrangea with fleshy, shining green leaves and globose heads of pink, blue or white sterile flowers, variously known as *H. opuloides* K. Koch, *H. hortensis* Smith, *H. Hortensia* Sieb. and so forth. The second, *Viburnum serratum*, is the Hydrangea with dull green thinner leaves and more slender shoots which is hardier than the former. Of this, too, there are many garden forms cultivated.

Hydrangea macrophylla De Candolle, Prodr. IV. 15 (1830).

Viburnum macrophyllum Thunberg, Fl. Jap. 125 (1784).

Hortensia Commerson apud Jussieu, Gen. Pl. 214 (1789).

Hortensia opuloides Lamarck, Encycl. Méth. III. 136 (1789); Tab. Encycl. Méth. II. 501, t. 380 (1793).—Jacquin, Fragm. Bot. 7, t. 3, fig. 5 (1800).—Jaume in Nouv. Duhamel, III. 98, t. 24 (1806).

Primula mutabilis Loureiro, Fl. Cochinch. 104 (1790).

Hortensia japonica Gmelin in Linnaeus, Syst. Nat. ed. 13, II. pt. 1, 722 (1791).—Buchoz, Monog. Ros. 267 (1804).

Hydrangea hortensis Smith, Icon. Piet. Pl., t. 12 (1792).—Sims in Bot. Mag. XIII. t. 438 (1799).—Willdenow, Sp. Pl. II. pt. 1, 633 (1799).—Roth, Neue Beytr. Bot. 202 (1802).—Martius, Pl. Hort. Acad. Erlang. 98 (1814).—Savi, Fl. Ital. III. 65, t. 110 (1824).—Franchet & Savatier, Enum. Pl. Jap. I. 150 (1875).—Nicholson, Dict. Gard. II. 162, fig. 252 (1887).—Rehder in Bailey, Cycl. Am. Hort. II. 784 (1900).—Bean, Trees & Shrubs Brit. Isl. I. 625 (1914).—Turner in Gard. Chron. ser. 3, LXXI. 87, fig. 42 (1922).

Hortensia mutabilis Schneevoogt, Icon. Pl. Rar. 36, t. (1793).—Zorn, Auswahl Schön. Gew. III. t. 149 (1796).

Hortensia japonica Zorn, Auswahl Schön. Gew. III. 58 (1796).

Hortensia rosea Desfontaines, Tab. Ecol. Bot. 115 (1804).

Hortensia speciosa Persoon, Syn. I. 505 (1805).—Targioni-Tozzetti in Ann. Imp. Mus. Firenze, I. (Obs. Bot.) 36, t. 2, figs. 51–58, 61, 63, 65–69 (1808).

Hydrangea Hortensia Siebold in Nov. Act. Acad. Leop.-Carol. XIV. pt. 2, 688 (Syn. Hydrang.) (1829).—De Candolle, Prodr. IV. 15 (1830).—Maximowicz in Mém. Acad. Sci. St. Pétersb., sér. 7, X. no. XVI. 11 (Rev. Hydrang. As. Or.) (1867).—Hemsley in Garden, VIII. 145 (1875); X. 265 (1876).

Hydrangea opuloides Hort. apud Savi, Fl. Ital. III. 65 (1824), as a synonym.—K. Koch, Dendr. I. 353 (1869).—Koehne, Dendrol. 187 (1893).—Dippel, Handb. Laubholzk. III. 321 (1893).—Schneider, Ill. Handb. Laubholzk. I. 391, fig. 251 e–i (1905).—Rehder in Sargent, Pl. Wilson. I. 37 (1911); in Bailey, Stand. Cycl. Hort. III. 162 (1915).—Matsumura, Ind. Pl. Jap. II. pt. 2, 179 (1912).

Hydrangea Hortensia γ. *flore pleno* K. Koch, Hort. Dendr. 106 (1853).

Hydrangea japonica η. *plena* Regel in Gartenfl. XV. 290 (1866).

Hydrangea japonica η. *Hortensia* Regel in Gartenfl. XV. 290 (1866).

Hydrangea Hortensia ε. *Hortensia* Maximowicz in Mém. Acad. Sci. St. Pétersb., sér. 7, X. no. XVI. 14 (Rev. Hydrang. As. Or.) (1867).

Hydrangea Hortensis 2. *hortensia* Franchet & Savatier, Enum. Pl. Jap. I. 152 (1875).—Rehder in Bailey, Cycl. Am. Hort. II. 785 (1900).

Hydrangea Hortensia c. *communis* Hemsley in Garden, X. 266 (1876).

Hydrangea opuloides a. *Hortensia* Dippel, Handb. Laubholzk. III. 322 (1893).—Rehder in Sargent, Pl. Wilson. I. 37 (1911); in Bailey, Stand. Cycl. Hort. III. 1621 (1915).—Matsumura, Ind. Pl. Jap. II. pt. 2, 180 (1912).

Hydrangea opuloides var. *plena* Rehder in Bailey, Stand. Cycl. Hort. III. 1621 (1915).

CHINA; cultivated. Kwangtung, Honan Island, *C. O. Levine*, No. 849, May 18, 1917; Hupeh, Ichang, *A. Henry*, No. 7385; Yunnan, Tali Valley, alt. 6700–8000 ft., *G. Forrest*, No. 5047, August, 1906.

A shrub with many ascending-spreading stems forming a broad, rounded bush from 1 to 4 m. tall, the shoots with abundant pith, clothed with thin, purple-gray to pale gray scaling bark, terete, glabrous, except near inflorescence, with prominent lenticels and leaf-scars. Leaves petiolate, lustrous green, fleshy, subcoriaceous, obovate, rarely ovate or ovate-elliptic, 8–20 cm. long, 4–10 cm. wide, cuspidate or short acuminate, at base cuneate, often broadly so, dentate-serrate, except near base; teeth inclined forward, triangular, terminating in a mucro-like gland, glabrous or slightly puberulous, with occasional axillary tufts of short, curled hairs;

secondary veins arcuate, raised beneath; petiole stout, fleshy, 1.5–6 cm. long, glabrous, flattened above. Inflorescence a much-branched, corymbose, terminal globose head from 15–20 cm. and more through, either subsessile or distinctly peduncled, rhachis glabrescent, puberulous or more or less densely clothed with short gray appressed curled hairs; flowers pink to blue, sometimes white, sterile, with 4 spreading petaloid sepals of various size and shape, acute or rounded, entire or notched with few scattered male or apetalous abortive female flowers.

This is the familiar Hydrangea with globose heads of sterile flowers of varying shades of pink and blue. One of the most widely cultivated and best-known exotic plants. It has been cultivated for centuries in the Orient, yet its origin has escaped notice and remained unknown until now. It is simply an anomalous condition of a littoral plant very common on the shores of the Boshu peninsula in central Hondo, on Oshima or De Vries' Island, on Hachijo and others of the seven isles of Idzu, described in detail below under the name of *H. macrophylla* var. *normalis*. Where it originated or by whom it was first found and brought into gardens remains a mystery. Very likely it was by some wandering Buddhist priest or acolyte but we shall probably never know. That such a striking plant with splendid flower-heads should spread far and wide among the flower-loving peoples of the Orient should occasion no surprise. Where any remarks on its possible origin have been made in western literature China has been surmised as its native country, probably because so many fine plants have come to us from that land. In this case, however, the credit belongs to Japan.

The replacing of the ordinary flowers by sterile flowers having petaloid sepals occurs in several species of Hydrangea. It is found in the Japanese *H. paniculata* Sieb. and in the American *H. cinerea* Small and *H. arborescens* Linn. In China I have collected wild specimens of *H. strigosa* Rehd. with globose heads of neuter flowers. It is probable that this character can and does appear as a sport in many species of Hydrangea. Also it occurs in several species of Viburnum, and Thunberg doubtless had in mind the sterile form of *Viburnum Opulus* Linn. when he referred this Japanese plant to the genus Viburnum. Thunberg's description is quite clear and De Candolle without hesitation refers it to the genus Hydrangea but does not suspect its identity with *H. Hortensia* Sieb. which he had described on the same page in his Prodromus. The most remarkable thing, however, about its name is the fact that, though many authors have dealt with the plant and several specific names have been established in common usage for it, apparently no one has gone to the trouble of finding out what Thunberg's *Viburnum macrophyllum* really was. For many years the problem of the origin of this plant has greatly interested me. In fact, during all my travels in the Orient I was on the look-out for the wild parent. Yet its discovery in March, 1917, was as surprising as it was welcome. The evidence was plain and conclusive though it seemed incredible that the

wild type of one of the most familiar garden plants should have its home at the very gate as it were of Yokohama and remain unrecognized by any botanist. However, such are the facts. At other times during 1917 and again the following year I prosecuted my investigations so as to leave no possible doubt on the subject. Exigencies of work have prevented the earlier publication of these facts.

The introduction of this plant into Europe seems to have been from China through Sir Joseph Banks early in 1789. In the Kew Bulletin for 1891 there appears a historical account of Kew and on page 305 it is stated that Banks introduced "the first *Hydrangea hortensis* to Kew about the beginning of 1789 for the inspection of the curious. It had begun to flower in the Custom House and its green petals were a puzzle to the botanists of the day. The next day he exhibited it at his house in Soho Square from whence it was removed and lived in Kew, the parent of its numerous progeny now spread all over Europe." In the Botanical Magazine XIII. under t. 438 it is stated that it "was introduced from China to the royal garden at Kew by Sir Joseph Banks in 1790; it was imported by Mr. Slater about the same time, with whom it is said to have first flowered in this country." Jussieu, in basing the genus Hortensia on the plant, calls it the Rose of Japan. Lamarck gives the same vernacular and on the authority of Commerson says it is cultivated in the Isle of France (Mauritius) and that it came originally from Japan and China. The first illustration published of the plant that I have been able to find is by Buchoz in his Fleurs de la Chine pt. 1, t. 45 (1776) with Chinese characters, evidently a copy of a Chinese drawing and rather crude. The first mention of this plant in western literature is by Kaempfer in his Amoenitatum Exoticarum Fasc. v. page 854 (1712) under the vernacular name of "Sijo, vulgo Adsai, it. Ansai & Adsikii." According to Smith there is (or was) a drawing of Kaempfer's under this name in the British Museum. In Japan today it is known as Temari-bana.

As a cultivated plant I am familiar with this Hydrangea in many parts of China from the coast to the extreme west and in all the warmer parts of Japan. Where there is iron in the soil the flowers are always blue. Cultivated by florists especially are many fine forms of this Hydrangea chiefly raised in France and referred to as French hybrids. From Messrs. Dreer & Co. of Riverton, New Jersey, I have received a set consisting of forty named garden forms but I can find no signs of hybridity in any of these. Apparently the word hybrid has been loosely used though I have no doubt crossings have been made with forms having only a few sterile ray-flowers all of which are referable to the var. *normalis* Wils. In none can I find any signs of the *H. serrata* De Candolle and its forms, the other Japanese species which has been so thoroughly confused with *H. macrophylla* and its varieties.

A form much cultivated is:—

Hydrangea macrophylla f. otaksa Wilson, n. comb.

Hydrangea Otaksa Siebold & Zuccarini, Fl. Jap. I. 105, t. 52 (1840).—Van Houtte in Fl. des Serr. XVII. 35, tt. 1732–33 (1867–68).—Neumann in Rev. Hort. 1868, 452, t.

Hydrangea Hortensia var. *Otaksa* A. Gray in Mem. Am. Acad. n. ser. VI. 312 (Bot. Jap.) (1857).—Maximowicz in Mém. Acad. Sci. St. Pétersb., sér. 7, X. no. XVI. 14 (Rev. Hydrang. As. Or.) (1867).—Hemsley in Garden, X. 266 (1876).

Hydrangea japonica ς. *Otaksa* Regel in Gartenfl. XV. 290 (1866).

Hydrangea Hortensis 1. *Otaksa* Franchet & Savatier, Enum. Pl. Jap. I. 152 (1875).—Nicholson, Dict. Gard. II. 163 (1887).

Hydrangea opuloides d. *Otaksa* Dippel, Handb. Laubholzk. III. 323 (1893).—Schneider, Ill. Handb. Laubholzk. I. 392 (1905).—Matsumura, Ind. Pl. Jap. II. pt. 2, 180 (1912).—Rehder in Bailey, Stand. Cycl. Hort. III. 1621, fig. 1933 (1915).

This form, characterized by its globose heads of sterile pink or blue flowers, is one of the most popular with florists in America and Europe. Siebold's name "Otaksa" is not used in Japan today and Japanese scholars fail to understand its derivation. A number of named forms are in cultivation including one with pure white flowers and known as Hydrangea "Thomas Hogg."

Very similar to the above is:—

Hydrangea macrophylla f. Veitchii Wilson, n. name.

Hydrangea Hortensia var. *japonica rosea* Bean in Garden, L. 122, t. 1079 (1896); not *H. japonica* var. *rosea* S. & Z.

Hydrangea hortensis var. *rosea* M. H. in Gartenwelt, VII. 582, t. (1903).—Grignan in Rev. Hort. 1904, 544, t.

Hydrangea Hortensia var. *rosea* J. H. Veitch, Hortus Veitchii, 368 (1906).

A garden form with deep rose-pink sterile flowers introduced from Japan into England by Charles Maries in 1880.

A form with black-purple shoots is:—

Hydrangea macrophylla f. mandschurica Wilson, n. comb.

Hortensia nigra Carrière in Rev. Hort. 1880, 180.

Hydrangea nigra Carrière, l. c., as a synonym.

Hydrangea Mandschurica nova Baumann apud Carrière, l. c., as a synonym.

Hydrangea ramis pictis Haage & Schmidt apud Carrière, l. c., as a synonym.

Hydrangea opuloides mandschurica h. apud Dieck, Haupt-Cat. Zoeschen, 42 (1885).

Hydrangea ramulis nigris Hort. ex Dieck, l. c. as a synonym.

Hydrangea mandschurica Koehne, Deutsch. Dendr. 187 (1893).

Hydrangea opuloides c. *cyanoclada* Dippel, Handb. Laubholzk. III. 323 (1893).—Rehder in Bailey, Stand. Cycl. Hort. III. 1621 (1915).

Hydrangea hortensis var. *nigra* Rehder in Bailey, Cycl. Am. Hort. II. 785 (1900).—Bean, Trees & Shrubs Brit. Isl. I. 625 (1914).

Hydrangea cyanoclada Hort. ex Bean, Trees & Shrubs Brit. Isl. I. 625 (1914), as a synonym.

A curious form with the young shoots dark purple, almost black, and rose-colored flowers most of which are sterile. The name "mandschurica" is utterly misleading, the plant having nothing to do with Manchuria. This form is cultivated (No. 5285) in the Arnold Arboretum and lives

through the winter in a sheltered situation but never flowers. The *H. Hortensia* ε. *ramis atropurpureis* K. Koch (Hort. Dendr. 106 [1853]) probably belongs here.

A form with double flowers is:—

Hydrangea macrophylla f. **Domotoi** Wilson, n. comb.
Hydrangea Domotoi K. in American Florist, 1923, 861.
Hydrangea Otaksa Domotoi Hort. Dreer & Sons.

The flowers of this form are all sterile and double, lavender to blue in color. It is said to have originated as a sport from *f. Otaksa* and is recognized here as the type of a race with double flowers.

The phylogenetic type may be named:—

Hydrangea macrophylla var. **normalis** Wilson, n. var.

JAPAN: Hondo, Oshima Island, *E. H. Wilson*, No. 8197, March 29, 1917; same locality, *H. Suzuki*, No. 8197a, July, 1917; Boshu peninsula, between Hojo and Kanaya, *E. H. Wilson*, No. 8207, April 11, 1917; Hachijo Island, *E. H. Wilson*, No. 8383, May 6, 1917.

This is the wild type and is distinguished by its flat corymb of hermaphrodite flowers with a few outer sterile pink ray-flowers each from 3 to 5 cm. in diameter. The fruit is stout, yellow-brown and erect, narrow-ovoid, 6–8 mm. long, 3–4 mm. wide, ribbed, crowned by 3 diverging woody styles from 1–3 mm. long; pedicels rigid 7–10 mm. long. The habit, the character of the shoots and the shape and texture of the leaves are all similar to those of the sterile form. The number of ray flowers with petaloid sepals is variable and so, too, is their size, and their color is of varying shades of pink to rosy-red, occasionally bluish or white.

This is a littoral plant abundant on the coasts of Oshima or De Vries' Island and the Boshu peninsula on the east coast of central Hondo and not far from the port of Yokohama. It is also plentiful on Hachijo Island, a volcanic island south of Oshima, and on Aogashima, another island just south of Hachijo. My friend, Dr. T. Nakai, informs me that he has found it wild on North Sulphur Island which is south of the Bonin Islands; also that it grows on the seacoast of Idzu and Sagami in central Hondo. I found the plant first in fruit and young foliage in March 1917 on Oshima and in the July following, my friend, H. Suzuki, collected for me flowering material. In the autumn of the same year I obtained seeds from which plants were raised and are now growing in this Arboretum. On Boshu and Hachijo I saw this plant growing in great quantity and that it is truly indigenous in these places there can be no doubt. Should anyone be disposed to question this as to Boshu and Oshima owing to their proximity to such a centre of culture as Tokyo I do not see how they can question Hachijo which is an out-of-the-way, sparsely inhabited island strewn with blocks of lava. Under the old regime when the Emperor lived in Kyoto and the Shogun in Tokyo, Hachijo was used as a penal settlement. Nevertheless, it is extraordinary that the identity of this plant as the wild parent of the familiar garden Hydrangea with globose

heads of sterile flowers should have remained unsuspected, at least so far as books are concerned, for I have searched high and low and can find no suggestion of it. Charles Maries in 1879 visited Oshima and there collected bulbs of *Lilium auratum* var. *platyphyllum* Baker. He must have seen this wild Hydrangea but I can find no record of its being mentioned by him although he did introduce two fine forms of Hydrangeas which are named *Mariesii* and *Veitchii*. Different Japanese botanists have visited Oshima and the other stations of the plant, but I cannot find that any one of them has identified this or saw in it anything significant, although Dr. T. Nakai informs me that he, for some time past, has been aware of its identity, but has not published his conclusions. The wild plant is a shrub from 1 to 3 m. tall with many stems forming a broad bush which occurs either singly or many together making a dense thicket. It grows right on the edge of the foreshore under the full influence of the sea and also inland among volcanic detritus, but all parts of the localities in which I know this plant to be wild are strongly influenced by the sea. The plant is in fact simply and solely a littoral plant, an important point to be remembered when you come to discuss *Hydrangea serrata* DC., with which it is almost inextricably confused. The giving of a special varietal name to the wild plant may conduce to clearness though there is nothing to distinguish it from such garden forms as Siebold's *H. japonica* (which by the way is not the plant known in gardens today by this name) except its entire petaloid sepals which may or may not be a constant character. The Japanese name of this plant is Gaku or Gaku-bana.

A form with blue flowers is:—

Hydrangea macrophylla var. **normalis** f. **coerulea** Wilson, n. comb.
Hydrangea Belzonii Siebold & Zuccarini, Fl. Jap. I. 109, t. 55 (1840).
Hydrangea Japonica var. *caerulea* Hooker in Bot. Mag. LXXII. t. 4253 (1846).
Hydrangea Hortensia β. *coerulea* K. Koch, Hort. Dendr. 106 (1853).
Hydrangea japonica ε. *coerulescens* Regel in Gartenfl. XV. 290 (1866).
Hydrangea Hortensia γ. *Belzonii* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, X. no. XVI. 14 (Rev. Hydrang. As. Or.) (1867).—Hemsley in Garden, X. 266 (1876).
Hydrangea opuloides e. *Belzonii* Dippel, Handb. Laubholzk. III. 322 (1895).—Rehder in Bailey Stand. Cycl. Hort. III. 1621 (1915).
Hydrangea hortensis var. *Belzonii* Nakai in Tokyo Bot. Mag. XXXI. 196 (1917).
Hydrangea opuloides var. *japonica* f. *coerulea* Rehder in Jour. Arn. Arb. III. 43 (1922).

This form is distinguished by its deep blue hermaphrodite flowers and blue or white sterile ray-flowers. The leaves are ovate-elliptic to obovate. As Rehder points out this is a very hardy form.

Siebold figures for his *H. Belzonii* a plant with obovate leaves in whorls of three and states in the text that the leaves are ternate or rarely opposite. I have seen no specimens with leaves so arranged though doubtless it does occur on some cultivated plants. Siebold also states that the ray-flowers are very numerous, being from 12 to 15, and he figures a fragment of an inflorescence in which all the flowers are sterile. A co-type in the Gray Herbarium of the plant referred by Maximowicz to his var. *Belzonii* has

opposite leaves; another specimen in the same herbarium from the Herb. Lugd.-Batav. and named *H. Belzonii* has opposite, ovate leaves and nearly ripe fruits. The Japanese name Oho-Azisai given by Siebold and Zuccarini merely signifies "Large Azisai" and is virtually meaningless.

Another form is:—

Hydrangea macrophylla var. **normalis** f. **azisai** Wilson, n. comb.

Hydrangea Azisai Siebold in Nov. Act. Acad. Leop.-Carol. XIV. pt. 2, 689 (Syn. Hydrang.) (1829).—De Candolle, Prodr. IV. 666 (1830).—Siebold & Zuccarini, Fl. Jap. I. 104, t. 51 (1840).

Hydrangea Hortensia var. *Azisai* A. Gray in Mem. Am. Acad. II. ser. VI. 312 (Bot. Jap.) (1857).—Maximowicz in Mém. Acad. Sci. St. Pétersb., sér. 7, X. no. XVI. 14 (Rev. Hydrang. As. Or.) (1867).—Hemsley in Garden, X. 266 (1876).

Hydrangea Hortensis ε. *Azisai* Franchet & Savatier, Enum. Pl. Jap. I. 152 (1875).

Hydrangea opuloides b. *Azisai* Dippel, Handb. Laubholzk. III. 322 (1893).—Schneider, Ill. Handb. Laubholzk. I. 392 (1905).—Rehder in Bailey, Stand. Cycl. Hort. III. 1621 (1915).

This is a Japanese garden plant distinguished by its ovate to elliptic-ovate leaves, and pale blue to white sterile ray-flowers on very long (2.5 cm.) pubescent pedicels. The vernacular name Azisai is by no means restricted to this particular form and is in fact more generally applied to *H. serrata* DC. which is common on the mountains throughout the length and breadth of Japan.

A form with white ray-flowers is:—

Hydrangea macrophylla var. **normalis** f. **macrosepala** Wilson, n. comb.

Hydrangea japonica ε. *macrosepala* Regel in Gartenfl. XV. 290, t. 520 (1866).

Hydrangea opuloides f. *macrosepala* Dippel, Handb. Laubholzk. III. 323 (1893).—Rehder in Bailey, Stand. Cycl. Hort. III. 1621 (1915).

Hydrangea hortensis var. *macrosepala* Rehder in Bailey, Cycl. Am. Hort. II. 785 (1900).

This garden form is characterized by its white, toothed, sterile ray-flowers.

A form with pink ray-flowers is:—

Hydrangea macrophylla var. **normalis** f. **rosea** Wilson, n. comb.

Hydrangea japonica Siebold in Nov. Act. Acad. Leop.-Carol. XIV. pt. 2, 689 (Syn. Hydrang.) (1829).—De Candolle, Prodr. IV. 666 (1830).—Siebold & Zuccarini, Fl. Jap. I. 106, t. 53 (1840) in part.

Hydrangea japonica var. *rosea* Siebold & Zuccarini, Fl. Jap. I. 107 (in text) (1840).

Hydrangea japonica α. *typica* Regel in Gartenfl. XV. 289 (1866).

Hydrangea Hortensia β. *japonica* Maximowicz in Mém. Acad. Sci. St. Pétersb., sér. 7, X. no. XVI. 14 (Rev. Hydrang. As. Or.) (1867).—Hemsley in Garden, X. 266 (1876).

Hydrangea Hortensis β. *Japonica* Franchet & Savatier, Enum. Pl. Jap. I. 151 (1875).—Nicholson, Dict. Gard. II. 162 (1887).

Hydrangea opuloides var. b. *japonica* Schneider, Ill. Handb. Laubholzk. I. 392 (1905).—Matsumura, Ind. Pl. Jap. II. pt. 2, 179 (1912), in part.—Rehder in Bailey, Stand. Cycl. Hort. III. 1621 (1915).

This form has pink, more or less toothed ray-flowers, otherwise it is very similar to the wild form. Of the vernacular names cited by Siebold & Zuccarini only "Gakuso" is applicable to this plant. In gardens today the plant generally cultivated under the name of *H. japonica* is not Siebold's plant but is the form *rosalba* of *H. serrata* DC. which is the "Benikaku" of the Japanese. Siebold and Zuccarini applied this vernacular name among others to their *H. japonica* and it is probably this that has lead Japanese botanists astray in the identification of Siebold's species.

A fine garden form is:—

Hydrangea macrophylla var. **normalis** f. **Mariesii** Wilson, n. comb.

Hydrangea Hortensia var. *Mariesii* Bean in Garden, LIV. 390, t. 1196 (1898).—J. H. Veitch, Hortus Veitchii, 368 (1906).

Hydrangea hortensis var. *Mariesii* Bean, Trees & Shrubs Brit. Isl. I. 625 (1914).

Hydrangea opuloides var. *Mariesii* Rehder in Bailey, Stand. Cycl. Hort. III. 1621 (1915).

A garden form introduced into England from Japan in 1880 by Charles Maries characterized by its large, sterile, rose-pink ray-flowers which measure from 7 to 8 cm. across and are entire or sparsely toothed.

A form with variegated leaves is:—

Hydrangea macrophylla var. **normalis** f. **maculata** Wilson, n. comb.

Hydrangea hortensis var. *maculata* Blume, Bijdr. 920 (1826).

Hydrangea japonica fol. albo-variegatis van Houtte in Fl. des Serr. VII. 139, t. 696 (1851–52).

Hydrangea Hortensia ε. *maculata* K. Koch, Hort. Dendr. 106 (1853).

Hydrangea japonica ς. *variegata* Regel in Gartenfl. XV. 290 (1866).

Hydrangea hortensis variegata Nicholson, Dict. Gard. II. 163 (1887).

Hydrangea opuloides var. *variegata* Rehder in Bailey, Stand. Cycl. Hort. III. 1622 (1915).

Distinguished by the white edging of the leaves. This form was in cultivation at Batavia at a very early date, having been introduced directly from Japan. Other garden forms with vari-colored leaves are known as f. *tricolor*, *nivalis* and *roseo-marginata*.

Hydrangea serrata De Candolle, Prodr. IV. 15, 666 (1830).—Dippel, Handb. Laubholzk. III. 325, fig. 173 (1893).—Schneider, Ill. Handb. Laubholzk. I. 392 (1905).

Viburnum serratum Thunberg, Fl. Jap. 124 (1784).

Hydrangea Thunbergii Siebold in Nov. Act. Acad. Leop.-Carol. XIV. pt. 2, 690 (Syn. Hydrang.) (1829).—Siebold & Zuccarini Fl. Jap. I. 111, t. 58 (1840).—Maximowicz in Mém. Acad. Sci. St. Pétersb., sér. 7, X. no. XVI. 15 (Rev. Hydrang. As. Or.) (1867).—T. Moore in Gard. Chron. 1870, 1699, fig. 297.—Franchet & Savatier, Enum. Pl. Jap. I. 153 (1875).—Hemsley in Garden, X. 266 (1876).—Nicholson, Dict. Gard. II. 163 (1887).—Bean, Trees & Shrubs Brit. Isl. I. 630 (1914).

Hydrangea Hortensis ζ. *angustata* Franchet & Savatier, Enum. Pl. Jap. I. 151 (1875).

Hydrangea opuloides e. *angustata* Schneider, Ill. Handb. Laubholzk. I. 392 (1905).—Matsumura, Ind. Pl. Jap. II. pt. 2, 179 (1912), in part.

Hydrangea hortensis var. *serrata* Rehder in Bailey, Cycl. Am. Hort. II. 785 (1900).

Hydrangea opuloides var. *Thunbergii* Makino in Tokyo Bot. Mag. XXVI. 389 (1912).

Hydrangea cyanea Hort. apud Bean, Trees & Shrubs Brit. Isl. I. 630 (1914).

Hydrangea opuloides var. *serrata* Rehder in Bailey, Stand. Cycl. Hort. III. 1621 (1915).

Hydrangea petiolaris Hort. ex Herb. Arnold Arboretum.

JAPAN: Kyushu: prov. Satsuma, Kirishima, alt. 1000–4000 m., *Z. Tashiro*, October, 1917; Shikoku, prov. Tosa, Shiraga-yama, alt. 1100 m., *E. H. Wilson*, No. 1720, November 22, 1914; Naruokawa, *K. Watanabe*, July, 1888 (Herb. Gray); Honshu: prov. Settsu, Arima, *J. Henry* (No. M 83); prov. Yamashiro, Kyoto, June 24, 1911; prov. Shinano, Otaki-gawa, alt. 1000 m., *E. H. Wilson*, No. 7767, November 1, 1914; Yokogura, *U. Faurie*, No. 6859, August 30, 1905; Ogawa, *J. G. Jack*, September 4, 1905; prov. Sagami, Komagatake, alt. 2000 m., *U. Faurie*, No. 6862, July, 1905; Miyanoshita, *C. S. Sargent*, August 25, 1892, same locality, *Drs. Fred & Charlotte Baker*, June 18, 1914, Hakone, *C. Maximowicz*, 1862 (Herb. Gray); prov. Musashi, Mitsumine-san, *E. H. Wilson*, No. 6963, June 8, 1914; same locality, June 24, 1911, Mt. Buko, *K. Sakurai*, June 25, 1911; prov. Kai, Jizo-gatake, *U. Faurie*, July, 1903; prov. Kozuke, Karuizawa, alt. 1000 m., *E. H. Wilson*, Nos. 7419, 7146, August 1, 1914; prov. Shimotsuke, Nikko region, alt. 1000–3000 m., *E. H. Wilson*, June 28, 1914; Lake Chuzenji, *J. G. Jack*, August 10 and 12, 1905; Wilford Exhibition of Herb. Lugd. Bata.: as *Hydrangea Buergeri* and *H. japonica* (Herb. Gray).

KOREA: Quelpaert Island, alt. 600 m., *E. H. Wilson*, No. 9402, October 20, 1917; same place and collector, No. 9402a, November 6, 1917, same locality, *U. Faurie*, Nos. 355, 359, 1055, October, 1906, July, 1907, same locality, *K. Taquet*, No. 4240, July 15, 1910.

CULTIVATED: Arnold Arboretum, July 20, 1890, July 9, 1897, Nos. 519, 519–1, cult., July 9, 1910, *E. H. Wilson*, No. 7621; Kew Gardens, *G. Nicholson*, No. 2900, July 15, 1882; Hort. Muskau, September 15, 1896, ex Herb. Zabel, No. 1881, Botanic Garden, Sapporo, Hokkaido, *E. H. Wilson*, No. 7303, July 29, 1914; same garden, *S. Arimoto*, September 7, 1903 (Herb. Gray).

Shrub 1–2.5 m. tall (usually 1–1.5 m.) with erect slender stems, glabrous or pubescent the first year, clothed with thin brown-purple scaling bark. Leaves membranous, dull dark green, lanceolate or elliptic to ovate, rarely broadest above the middle, without petiole 5–10 cm. long, 1.5–5 cm. wide, acuminate; the base cuneate, rarely abruptly so, sometimes attenuate and oblique, finely or coarsely serrate, often entire at base; the teeth terminating in gland-tipped mucro, sparsely clothed with appressed soft pubescence on both surfaces, with small axillary tufts of curled hairs on the lower surface; midrib with short curled hairs sometimes on upper surface only; petiole 1–2.5 cm. (sometimes 5 cm.) long, usually slender. Flowers blue or white in flat or slightly convex corymbs, 5–10 cm. across with 4 or 5 white, blue or pinkish petaloid, orbicular, ovate or lanceolate, rounded, obtuse or more rarely acute sepals. Capsule thin-walled, ovoid, subglobose, 2–4 mm. long, on a slender pedicel and tipped by 3 short diverging styles.

This is a common woodland plant on the mountains from the extreme south of Japan to southern Hokkaido; it is also plentiful on the Korean island of Quelpaert and on the mainland as far north at least as Chiri-san. At the northern limits of this species the plant is found at sea-level but always in cool situations. It loves woodland soil and shade and it is only at high altitudes and at its northern limits that it grows in open places. The plant varies greatly in the size, shape and dentation of the

leaves and in degree of hairiness; the sterile flowers may be blue, white or pinkish and the shape of the petaloid sepals varies from nearly round to lance-shape and either rounded blunt or pointed. It is a hardy plant and I have seen it flourishing in the Botanic Garden in Sapporo, Hokkaido. In this Arboretum it has flowered many times but the plant does not thrive. It has several Japanese names such as Hosoba-amacha, Yama-ajisai and Sawa-ajisai but the one I heard most usually applied to this plant is Yama-ajisai which may be interpreted Mountain Hydrangea.

As they grow wild no two species could be more distinct than the littoral *H. macrophylla* var. *normalis* Wils. and the woodland *H. serrata* DC., but in herbaria it is not easy to distinguish between dried specimens of the extreme forms of each and this has had much to do with the hopeless confusion between them which obtains in books. The relatively thick, fleshy, shining green leaves of the former and the thin, dull dark green leaves of *H. serrata* readily distinguish the species. The woodland plant is in every way a less vigorous plant than its relative of the seashore whose leaves are usually broadest above the middle and rarely so in the woodland species. From Siebold all authors have recognized under various names these two species as distinct and those familiar with the living plants have never hesitated in the matter but the forms of the dull green membranous-leafed species have been confused under *H. macrophylla*. The synonymy shows this very clearly and perhaps is more expressive than any lengthy explanation could possibly be.

In Thunberg's Herbarium the three specimens named *Viburnum serratum* γ, δ, and ε are the type of the species.

A form with large leaves is:—

Hydrangea serrata f. **acuminata** Wilson, n. comb.

H. acuminata Siebold & Zuccarini, Fl. Jap. I. 110, tt. 56, 57, fig. 1 (1840).—Carrière in Rev. Hort. 1874, 91, t.—Bean, Trees & Shrubs Brit. Isl. I. 625 (1914).

H. Burgeri Siebold & Zuccarini, Fl. Jap. I. 111, t. 57, fig. 2 (1840).

H. Hortensia α. *acuminata* Maximowiczii in Mém. Acad. Sci. St. Pétersb., sér. 7, X. no. XVI. 13 (Rev. Hydrang. As. Or.) (1867), not A. Gray in Pl. Wright.—Hemsley in Garden x. 265 (1876).

H. Hortensis α *acuminata* Franchet & Savatier, Enum. Pl. Jap. I. 150 (1875).—Rehder in Bailey, Cycl. Am. Hort. II. 785 (1900).

H. opuloides var. *acuminata* Dieck, Haupt-Cat. Zoeschen, 42 (1885).—Dippel, Handb. Laubholzk. III. 323 (1893).—Schneider, Ill. Handb. Laubholzk. I. 391, fig. 250 a–t (1905).—Rehder in Bailey, Stand. Cycl. Hort. III. 1021 (1916).

H. arvalioides var. *angustata* Matsumura, Ind. Pl. Jap. II. pt. 2, 179 (1919), in part, vix Franchet & Savatier.

H. opuloides var. *acuminata* f. *Burgeri* Purpus in Moeller's Deutsch. Gärtn. Zeit. XXXII. 41, fig. (1917).

JAPAN. Kyushu: Tsu-shima Island, *C. Wilford*, 1859 (Herb. Gray); prov. Satsuma, Mt. Kirishima, alt. 100–1000 m., *Z. Tashiro*, June 24–July 20, 1917; prov. Osumi, Nisa-kirishima, *E. H. Wilson*, No. 6244, March 3, 1914.—Honshu: prov. Uzen, Adzuma-san, alt. 600–11000 m., *E. H. Wilson*, No. 7212, July 19, 1914; prov. Ugo, Chokai-san, *E. H. Wilson*, No. 7173, October 14, 1914; prov.

Mutsu, Lake Towada, *E. H. Wilson*, No. 7621, October 5, 1914; Hakkoda-yama, alt. 1000–1500 m., *E. H. Wilson*, No. 7118, July 6, 1914. Hokkaido: prov. Oshima, Hakodate, *C. Maximowicz*, 1861 (Herb. Gray); prov. Shiribeshi, Shiribeshi-san, alt. 1000 m., *E. H. Wilson*, No. 7298, July 27, 1914; prov. Ishikari, Moiwa-dake, ex Herb. Sapporo Agric. College, July 29, 1891; same locality, *C. S. Sargent*, September 17, 1892; same locality, *S. Arimoto*, September 24, 1903, (Herb. Gray); Yubari, *E. Tokubuchi*, August 11, 1893 (Herb. Gray).

KOREA: Quelpaert Island, *E. H. Wilson*, No. 9402, November 2, 1917; same locality, June 25, 1908, *E. Taquet*, Nos. 811, 2886, 2887, June, 1909, July, 1909.

CULTIVATED: Arnold Arboretum, July 9, 1904 (No. 4710); Japan, Hokkaido, Botanic Garden, Sapporo, *C. S. Sargent*, September 16, 1892.

This form may be distinguished by its larger caudate-acuminate leaves 9 to 18 cm. long and 5–12 cm. wide, though it is scarcely worth a distinctive name. It has a similar distribution to the type but is more common in the northern part of Hondo and in Hokkaido. The sterile ray-flowers are usually blue but not invariably so on the wild plants. In books A. Gray is cited as the first to unite Siebold's *H. acuminata* with *H. Hortensia* DC. and there is no doubt Gray intended to do this but the specimens he so named in the Gray Herbarium belong to a different species recently named *H. Kawagoeana* Koidzumi (in Tokyo Bot. Mag. XXXII. 138 [1918]). The material in the Gray Herb. consists of one sheet of four fragments each in flower and bears two labels. One label says, "Loo-choo Islands, Cleopatra Island, T. Small"; the other "Simoda, Japan, C. Wright coll." The material is obviously all from the same plant and I am sure came from Cleopatra Island and not from Simoda. The firm purple-brown bark at once distinguishes this plant from either Siebold's or De Candolle's species.

Another form is:—

Hydrangea serrata f. **pubescens** Wilson, n. comb.

Hydrangea Hortensis β. *pubescens* Franchet & Savatier, Enum. Pl. Jap. I. 151 (1875), not *H. pubescens* Decaisne.

Hydrangea opuloides i. *sinensis* Dippel, Handb. Laubholzk. III. 324, fig. 172 as *H. sinensis* (1893).

Hydrangea opuloides d. *pubescens* Schneider, Ill. Handb. Laubholzk. I. 392 (1905).—Matsumura, Ind. Pl. Jap. II. pt. 2, 180 (1912).

Hydrangea sinensis Hort. Simon Louis.

JAPAN. Hokkaido: prov. Oshima, Hakkodate, *Dr. M. Albrecht*, (Herb. Gray).

KOREA: Quelpaert Island, October, 1906, *U. Faurie*, No. 357; same locality, *E. Taquet*, No. 810, July, 1908.

CULTIVATED: Arnold Arboretum, No. 2443-2; Hort. Simon Louis, 1888, Herb. H. Zabel.

This pubescent form with ovate to ovate-elliptic, caudate-acuminate leaves is fairly distinct though very close to the form *acuminata*. The sterile ray-flowers are pink and white and the fertile flowers blue. The principal veins on the underside are bearded with soft appressed and spreading hairs; the base of the leaf is rounded and abruptly cuneate or narrow and cuneate. The Japanese name of this form is Iwa-gaku.

A form with flowers of various colors is:—

Hydrangea serrata f. rosalba Wilson, n. comb.

Hydrangea japonica Siebold & Zuccarini, Fl. Jap. I. 106 (1840), in part.—Lindley in Bot. Reg. xxx. t. 61 (1844).—Paxton, Mag. Bot. XII. 199, t. (1846).—Bean, Trees & Shrubs Brit. Isl. I. 626 (1914).

Hydrangea japonica rosalba Van Houtte in Fl. des Serr. XVI. 75, tt. 1649–50 (1865–66).—Carrière in Rev. Hort. 1866, 432, t.—Regel in Gartenfl. XV. 290 (1866).

Hydrangea japonica β. *Lindleyi* Regel in Gartenfl. XV. 289 (1866).

Hydrangea opuloides α. *roseo-alba* Dippel, Handb. Laubholzk. III. 324 (1893).

Hydrangea Hortensis var. *Lindleyana* Nicholson in Garden, XLVI. 466 (1894).

Hydrangea Lindleyana Nicholson in Garden, XLVI. t. 990 (1894).

Hydrangea hortensis var. *rosalba* Rehder in Bailey, Cycl. Am. Hort. II. 785 (1900).

Hydrangea opuloides var. *Lindleyana* Rehder in Bailey, Stand. Cycl. Hort. III. 1621 (1915).

Hydrangea opuloides var. *rosalba* Rehder in Mitt. Deutsch. Dendr. Ges. XXIV. 220 (1915).

CULTIVATED: Arnold Arboretum (Nos. 516, 516–1, 517, 517–1, 521, 521–1, 522–1, 2210–1, 2442, 2444); Hort. Bot. Gard. Washington, *A. Rehder*, June 27, 1900; Hort. Kew, *G. Nicholson*, Nos. 1777, 1784, 1789, July 19, 1880; Hort. Bot. Gard. Kiel, *B. Graef*, No. 3557, 1897. Japan; Hort. Sakurai, *K. Sakurai*, May 12, 1906; Tokyo, *K. Miyabe*, June 10, 1882.

In this form the leaves are somewhat pubescent on the underside and on the upper surface of the midrib especially at the base, and vary in shape from obovate to ovate-elliptic. The sterile ray-flowers may be white or pink or in fading may change from one color to the other. The petaloid sepals may be deeply or sparingly toothed, or they may be entire. It is a variable and very common form and is often cultivated under the erroneous name of *H. japonica*. There are also very many garden forms of this plant; indeed, most of them which have been raised in France and have dull green leaves have been derived from it; such is *H.* "Impératrice Eugénie" Carrière in Rev. Hort. 1868, 469, t.

A form with numerous sterile flowers is:

Hydrangea serrata var. **stellata** Wilson, n. comb.

Hydrangea Sitsitan Siebold in Nov. Act. Acad. Leop.-Carol. XIV. pt. 2, 692 (Syn. Hydrang.) (1829).—De Candolle, Prodr. IV. 666 (1830).

Hydrangea stellata Siebold & Zuccarini, Fl. Jap. I. 112, t. 59 (1840).—Regel in Gartenfl. XV. 291 (1866).—Bean, Trees & Shrubs Brit. Isl. I. 626 (1914).

Hydrangea stellata β. *prolifera* Regel in Gartenfl. XV. 291, t. 521 (1866).—Nicholson, Dict. Gard. II. 163 (1887).

Hydrangea Hortensia η. *stellata* Maximowicz in Mém. Acad. Sci. St. Pétersb., sér. 7, X. no. XVI. 14 (Rev. Hydrang. As. Or.) (1867).—Hemsley in Garden X. 266 (1876).

Hydrangea Hortensis 3. *stellata* Franchet & Savatier, Enum. Pl. Jap. I. 152 (1875).

Hydrangea opuloides h. *stellata* Dippel, Handb. Laubholzk. III. 324 (1893).—Schneider, Ill. Handb. Laubholzk. I. 392 (1905).—Matsumura, Ind. Pl. Jap. II. pt. 2, 180 (1912).—Rehder in Bailey Stand. Cycl. Hort. III. 1622 (1915).

Hydrangea opuloides var. *prolifera* Rehder in Bailey, Stand. Cycl. Hort. III. 1622 (1915).

This is a sterile form with numerous petaloid sepals, pink rose or white in color and ovate to lanceolate in shape. Siebold records it as cultivated

round Kyoto. It is in fact a common plant in Japanese gardens where according to Matsumura it is known as Shichidankwa. There are a number of garden forms cultivated of which "fimbriata" and "rubroplena" are examples. There seems no good reason for keeping Regel's f. *prolifera* distinct from the type.

In Thunberg's Herbarium the specimen named *Viburnum serratum* α. represents the var. *stellata* but I do not think that this specimen should be considered the type since Thunberg does not cite under his description any particular specimen and since the majority of them belong to the form here considered the typical *H. serrata* DC.

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE HERBARIUM AND THE COLLECTIONS OF THE ARNOLD ARBORETUM[1]

ALFRED REHDER

Sinowilsonia Henryi Hemsley in Hooker's Icon. XXIX. t. 2817 (1906).—Rehder & Wilson in Sargent, Pl. Wilson. I. 429 (1913).

Descriptioni addc: Flores monoeci, proterandri, racemosi; racemi terminales, masculi et feminei plerique in ramis distinctis; racemi masculi praecoces, e gemmis aphyllis terminalibus orti, pedunculo brevi 5–8 mm. longo incluso 4–6 cm. longi, penduli, multiflori, densi; rhachis sparse fusco-stellato-pilosa; flores apetali et sine ullo vestigio ovarii, bracteati bracteis lineari-subulatis pedicellum paullo superantibus sparse fusco-stellato pilosis a basi pedicelli plerisque plus minusve remotis; pedicelli sparsissime stellato-pilosi, 1.5–3 mm. longi, bracteolis 2 lateralibus bracteis simillimis sed brevioribus plerisque circa medium insertis instructi; sepala 5, lineari-spathulata, 3–4 mm. longa, antheras vix vel paullo superantia, dorso apicem versus dense fusco-stellato-pilosa, post anthesin recurva, plus minusve irregulariter inserta et non stricte verticillata; stamina 5, episepala, filamentis brevissimis basi sepalorum adnatis, antheris anguste ovalibus 2.5 mm. longis apiculatis rimis lateralibus dehiscentibus: racemi feminei densi, sub anthesi in plante nostra 1.5–2.5 cm. longi, demum multo elongati, flores cum stigmatibus inclusis 5 mm. longi; calycis tubus sub anthesi 1.5 longus et ovarium paullo tantum superans; sepala 2 mm. longa; stigmata violacea.

The flowering for the first time in this Arboretum of *Sinowilsonia Henryi* offered an opportunity to study the hitherto unknown staminate flowers, which, as the description shows, are greatly simplified in their structure. The flowers are arranged in catkin like racemes very similar in appearance to those of some Amentaceae, particularly to certain Poplars. The whole floral structure appears more or less irregular; the bracts are inserted,

[1] Continued from p. 116.

usually considerably below the pedicel to which they belong and appear therefore irregularly scattered between the pedicels along the rhachis; the anthers and the sepals before anthesis are nearly or quite of the same length and are inserted approximately at the same height, but during anthesis the axis lengthens and disarranges the floral whorls which become thus more or less racemose. The tendency at the same time of the parts to assume an unilateral position and the absence of any vestige of an ovary makes the similarity of the inflorescence to that of Populus still greater. The staminate flowers of Sinowilsonia certainly show greater approach to a primitive structure than those of any of the related genera and in the catkin-like shape of the inflorescence resemble the incompletely known staminate flowers of Fortunearia (see Rehder & Wilson in Sargent, Pl. Wilson. I. 428) which, however, have at least a rudimentary ovary. The much elongated calyx-tube of the pistillate flower, as described and figured by Hemsley, represents the state as it appears some time after anthesis. During anthesis it is not much longer than the ovary, but it begins to lengthen afterwards, as the growing flowers on our living plant have shown.

Tilia platyphyllos var. **rubra**, comb. nov.

T. europaea 5. *rubra* Weston, Bot. Univ. I. 298 (1770).
T. europaea ε. *corallina* Aiton, Hort. Kew. II. 229 (1789).
?*T. rubra* De Candolle, Cat. Pl. Monspel. 150 (1813); Prodr. I. 513 (1825), in part.
T. corallina Smith in Rees, Cycl. XXXV. no. 2 (1819).—Bosc in Encycl. Méth. Agric. VII. 748 (1821).
T. rubra G. Don, Gen. Syst. I. 553 (1831), in part.—Kirchner in Petzold & Kirchner, Arb. Musc. 155 (1864), in part.
T. mollis var. *corallina* Spach in Ann. Sci. Nat. sér. 2, II. 338 (1834).
T. grandifolia γ. *rubella* Ortmann in Flora, XVIII. 502 (1835).
T. platyphyllos var. *corallina* Hartwig & Ruempler, Bäume & Sträuch. 570 (1875).—Dippel, Handb. Laubholzk. III. 61 (1893), in part.
T. grandifolia corallina C. Koch[1] apud Beissner, Schelle & Zabel, Handb. Laubholz-Ben. 339 (1903).

The oldest varietal name for this form is apparently *rubra*, based on *T. europaea* var. *rubra* Weston. This is identical, at least in part, with *T. rubra* G. Don, and probably also with *T. rubra* De Candolle, Cat. Pl. Monspel. 150 (1813), and Prodr. I. 513 (1825), a name applied by many authors to an entirely different species; a few remarks about this and *T. corinthiaca* Bosc may not be out of place here.

Tilia rubra was described by De Candolle in 1813 as intermediate between *T. microphylla* (= *T. cordata* Mill.) and *T. platyphyllos* and he stated that it was first separated by Bosc from these two European species and that it is commonly cultivated as a shade tree under the names "Tilleul a bois rouge," "Tilleul de Corinthe;" from the latter name he assumes that it was introduced from Greece. These remarks seem to

[1]K. Koch did not publish this combination; in 1853 (Hort. Dendr. 50) he cites *T. europaea* var. *corallina* Ait. as a synonym of *T. rubra* and in 1869 (Dendr. I. 472) he mentions *T. europaea corallina* among the forms of *T. platyphyllos* without making a varietal combination.

indicate that De Candolle as well as Bosc had in mind the hybrid between *T. cordata* and *T. platyphyllos* described the same year as *T. vulgaris* Hayne (*T. hybrida* Bechstein, a form or synonym of *T. vulgaris*, was first described and figured by Bechstein in 1819 in his Forstbot. ed. 3, 1463, tab. 4, not in 1810 as quoted by Schneider, and not by Behlen in ed. 5 as quoted in Index Kewensis), but the description of the under side of the leaves, the petioles and the branchlets as "pilosiuscula" and of the bark of the branches as red may be taken to indicate that the authors had before them a form of *T. platyphyllos* and probably the var. *rubra*. Bosc himself in 1821 refers his "Tilleul de Corinthe" to *T. corallina* (in Encycl. Méth. Agric. VII. 748) and Spach (in Ann. Sci. Nat. sér. 2, II. 337 [1834]) refers both names as synonyms to his *T. mollis* (= *T. platyphyllos*). In 1825 De Candolle gives "Tauria" as the habitat of *T. rubra* and cites a specimen collected by Steven without changing the description from that of 1813. This is not identical with *T. rubra* of Simonkai and of later authors which I refer to *T. dasystyla* Stev. (*T. begoniifolia* Stev., *T. multiflora* Ledeb., *T. caucasica* Rupr.), nor is it the *T. corinthiaca* of Simonkai (in Mat. Term. Közl. Mag. Tud. Akad. XXII. 330 [1888]); the characters of these two species do not agree with the descriptions given by Bosc and De Candolle and it is very unlikely that any of them were in cultivation at that time, while Bosc states that his "Tilleul de Corinthe" has been in cultivation since time immemorial. In regard to *T. corinthiaca* Bosc it should be stated that the name did not originate with Bosc who calls it "Tilleul de Corinthe" (in Nouv. Cours Agric. XII. 139 [1809] and in ed. 2. XXIII. 406 [1823]). Who first latinized Bosc's name I cannot say with certainty; I find it first mentioned by De Candolle in 1824 (Prodr. I. 513) as a synonym of his *T. rubra* for which he gives "*Tauria*" as the native country. This would leave without a name the form occurring in Greece and distinguished by Simonkai as *T. corinthiaca* Bosc, but I doubt if it is specifically distinct from *T. dasystyla* Stev.

Helianthemum nummularium var. **cupreum** Schneid. f. **crocatum**, comb. nov.

H. hyssopifolium α. *crocatum* Sweet, Cist. 29, t. (1825–30).

H. chamaecistus var. γ. *cupreum* Grosser in Engler, Pflanzenr. IV–193, 84 (1903), in part, as to synon. α. *crocatum*.

H. vulgare var. *crocatum* Bean, Trees & Shrubs Brit. Isl. I. 617 (1914).

This form differs from var. *cupreum* only in its saffron-yellow flowers more or less suffused with a ferrugineus or coppery tint.

As Janchen has shown (in Oesterr. Bot. Zeitschr. LVIII. 406–413 [1908]) the correct name according to the International Rules of the Sun Rose usually called *Helianthemum chamaecistus* Mill. or *H. vulgare* Gaertn. is *H. nummularium* Mill. based on *Cistus nummularius* L. Janchen, however, distinguishes besides *H. nummularium* the following species: *H. hirsutum* Mérat, *H. nitidum* Clementi, *H. tomentosum* Spreng. and *H. grandiflorum* Lam. & DC. which all seem to be connected by intermediate forms and are best considered varieties or subspecies of *H. nummularium*. Most of

the resulting new combinations have been already made by C. Schneider (Ill. Handb. Laubholzk. II. 351–352, 1909), but a few forms not unfrequently met with in gardens, as the one cited above and the following, were not mentioned by him.

Helianthemum nummularium var. **mutabile,** comb. nov.

Cistus mutabilis Jacquin, Misc. II. 340 (1781); Icon. Pl. Rar. I. 10, t. 99 (1781–86).

Helianthemum mutabile Persoon, Syn. II. 79 (1807).—Guimpel, Otto & Hayne, Abb. Fremd. Holzart. 56, t. 46 (1819–1825).—Sweet, Cist. 106, t (1825–30).

H. vulgare var. ε. *mutabile* Willkomm, Icon. Descript. Pl. II. 116 (1856).

H. chamaecistus var. ε. *mutabile* Grosser in Engler, Pflanzenr. IV–163, 86 (1903).

This variety has the leaves sparingly pilose above or nearly glabrous and gray-tomentose beneath. The sepals are reddish and villose on the ribs and glabrous between them; the petals are pale rose or sometimes variegated with white.

Helianthemum nummularium var. **stramineum**, comb. nov.

H. stramineum Sweet, Cist. 93, t. (1825–30).

H. chamaecistus var. ζ. *stramineum* Grosser in Engler, Pflanzenr. IV–163, 86 (1903).

H. vulgare var. *stramineum* Bean, Trees & Shrubs Brit. Isl. I. 617 (1914).

This variety has the leaves green and pilose above, whitish tomentose beneath, flat or scarcely revolute at the margins; the sepals are nearly glabrous and the petals sulphur-yellow with a darker yellow blotch at base.

Helianthemum nummularium var. **venustum**, comb. nov.

H. venustum Sweet, Cist. 10, t. (1825–30).

H. mutabile var. *canescens* (Sweet) K. Koch, Hort. Dendr. 37 (1853), in part.

H. chamaecistus var. δ. *venustum* Grosser in Engler, Pflanzenr. IV–163, 86 (1903).

H. vulgare var. *venustum* Bean, Trees & Shrubs Brit. Isl. I. 617 (1914).

This variety has purplish branchlets and the leaves glabrescent and lustrous above, whitish tomentose beneath; the sepals are stellate-puberulous, the petals rather large and crimson with a yellow blotch at base.

Helianthemum nummularium var. **diversifolium**, comb. nov.

H. diversifolium Sweet, Cist. 95, t. (1825–30).

H. mutabile Pers. γ. *diversifolium* K. Koch. Hort. Dendr. 37 (1853).

H. chamaecistus var. η. *diversifolium* Grosser in Engler, Pflanzenr. IV–163, 86 (1903).

This variety has the leaves hirsute above and whitish tomentose beneath, the upper ones linear-lanceolate, acute and revolute at the margin, the lower ones oval, obtuse and flat. The sepals are pilose, and the petals are red with a darker blotch at the base.

Helianthemum nummularium var. **diversifolium** f. **rubro-plenum,** nom. nov.

H. diversifolium β. multiplex Sweet, Cist. 98, t. (1825–30).

H. mutabile δ. *multiplex* K. Koch, Hort. Dendr. 37 (1853).

H. vulgare var. *diversifolium multiplex* Bean, Trees & Shrubs Brit. Isl. I. 617 (1914), not *H. nummularium* var. *tomentosum* f. *multiplex* Schneid.

This is a form with double flowers of the preceding variety.

Hedera nepalensis K. Koch var. **sinensis**, comb. nov.

H. Helix Hance in Journ. Bot. xx. 53 (1882).—Henslow in Journ. Linn. Soc. xxiii. 343 (1888), as to the Chinese plant.—Harms in Bot. Jahrb. xxix. 487 (1900).—Pavolini in Nuov. Giorn. Bot. Ital. n. ser. xv. 418 (1908).—Pampanini in Nuov. Giorn. Bot. Ital. n. ser. xvii. 678 (1910), xxiii. 130 (1911).—Hayata, Fl. Mont. Formos. 110 (1910); Icon. Pl. Formos. ii. 62 (1912).—Diels in Not. Bot. Gard. Edinburgh, vii. 278, 288 (1912).—Léveillé, Fl. Kouy-Tchéou, 34 (1914).

H. himalaica var. *sinensis* Tobler, Gatt. Hedera, 79, figs. 30–32 (1912).

H. himalaica Harms & Rehder in Sargent, Pl. Wilson. ii. 555 (1916), in part.

The difference between the Himalayan and the Chinese plant is quite marked in the leaves of the sterile branches which are more or less pinnately lobed with 2–5 lobes or coarse teeth on each side in the Himalayan plant and only 3-lobed in the Chinese plant, but otherwise the two forms show little difference except that the leaves are generally narrower and longer in the Himalayan plant. In the pinnately lobed leaves of the sterile branches the typical *H. nepalensis* differs from all other species and forms of Hedera, and none of the numerous specimens of the Chinese form in the Arboretum Herbarium show any tendency toward pinnate lobing, the leaves of the sterile shoots having never more than two small basal lobes.

When Tobler proposed his *H. himalaica* he overlooked the fact that in 1853 K. Koch (Hort. Dendr. 284) had already given the name *H. nepalensis* to this species basing it on the *H. Helix* of Don's Prodromus and Roxburgh's Flora Indica.

Rhododendron carolinianum var. **album**, comb. nov.

Rhododendron punctatum var. *album* Kelsey, Wholesale Trade List, Hardy Am. Pl. 1895–96, 10 (1895), nomen.—Hort. apud Rehder, in Bailey Cycl. Am. Hort. iv. 1523 (1902).—Rehder apud Schneider, Ill. Handb. Laubholzk. ii. 374 (1909).

Rhododendron carolinianum Norwoodiae Ashe in Rhodora, xxiii. 177 (1921).

This form differs from typical *R. carolinianum* Rehd. chiefly in the white color of the flowers and in the leaves which are as a rule larger and narrower and more pointed, even short-acuminate at the apex. According to Ashe (l. c.) it is common in North Carolina along the Blue Ridge at an altitude of between 1500 and 4000 ft. in McDowell and Buncombe Counties, and it has also been found in Rutherford, Polk and Henderson Counties, to which may be added Haywood County according to a specimen in this herbarium collected by H. D. House (No. 4563) on Fork Ridge, at 4500 ft. altitude. Ashe states that the white-flowered form has a definite range and is not found together with the typical rose-purple form which occurs at altitudes above 4000 ft. The white-flowered form was first introduced into gardens by Harlan P. Kelsey in 1895 and later repeatedly reintroduced from its native habitat.

Forsythia ovata Nakai in Bot. Mag. xxxi. 104 (1917); Fl. Sylv. Kor. x. 20, t. 3 (1921).

Descriptioni adde: Ramuli hornotini maturi cinereo-flavidi vel flavescentes, sparse lenticellati, secundo anno cinerascentes vel cinerei, cortice

tertio vel quarto anno leviter suberoso et rimis longitudinalibus fisso; medulla septata. Flores solitarii, brevissime pedicellati pedicello toto perulis abscondito; sepala late ovata, apice rotundata, medium corollae tubum aequantia, 2.5 mm. longa; corolla succinea ("amber yellow" ex Ridgway, Color Stand. pl. XVI. 21'b), tubo lato 5 mm. longo intus striis 12 aurantiacis notato, lobis late oblongis 11–12 mm. longis 5–6 mm. latis apice rotundatis vel leviter truncatis; stamina in planta visa microstyla tubum corollae paullo superantia.

Plants raised from seed collected by E. H. Wilson in Korea in 1917 flowered this spring for the first time in this Arboretum. As the flowers have not been described, a description drawn up from the living material is here given. *Forsythia ovata* appears to be a very distinct species; even in its winter state it is easily distinguished from the other species by the pale yellow color of the young branchlets and by the light gray bark of the older branchlets which become slightly corky and split by longitudinal fissures.

Viburnum corymbosum Rehder in Jour. Arnold Arb. III. 214 (December 28, 1922) is antedated by *V. corymbosum* Urban in Fedde, Rep. Spec. Nov. XVIII. 121 (August 15, 1922). When I published this new combination based on *Cassine corymbosa* Mill., the August number of Fedde's Repertorium had not yet reached the Arboretum library and I therefore was not aware of the existence of the older homonym. I consider it, however, rather fortunate that the publication of Urban's *V. corymbosum* makes it possible to retain the well-known name *V. oboratum* Walt. for the species in question, for the two other older names enumerated by me (l. c.) are non-valid names and cannot replace Walter's name. The first of these names, *Cassine peragua* of 1753 (l. c. 213, footnote 3) is a homonym of his earlier and valid *Cassine peragua* of 1753 (l. c. 213, footnote 3) and *Cassine caroliniana* Lamarck is not valid, because it is a synonym of the earlier and valid *Cassine corymbosa* Miller which, however, as already stated cannot be transferred to the genus Viburnum, on account of *V. corymbosum* Urb.

Lonicera subsessilis Rehder in Jour. Arnold Arb. II. 126 (1920); II. 240 (1922).

Lonicera diamantiaca Nakai in Jour. Coll. Sci. Tokyo XLII. 100 (1921).

Descriptioni adde: Frutex ramulis ab initio glabris, plus minusve purpureis vel purpurascentibus; folia juvenilia margine ciliolato et costa media supra minute glandulosa excepiis glabra, supra laete viridia, nitidula, subtus glaucescentia; flores pedunculis ad 3 mm. longis glabris; bracteae triangulari-ovatae, bracteolis breviores, glabrae; bracteolae 2, semiorbiculares, multo latiores quam longae, tertiam partem ovariorum ad medium vel fere ad apicem connatorum aequantes, circiter 1 mm. longae, margine minutissime glanduloso-ciliatae; dentes calycis 4, lanceolati, circiter 1 mm. longi, basi tantum vel vix connati, minute glanduloso-ciliati; corollae dorso contiguae ad directiones oppositas spectantes, profunde

bilabiatae, 1.2 mm. longae, extus glabrae, initio fere alba vel interdum ad apicem leviter rubescentes, mox flavescentes, leviter fragrantes, tubo 4 mm. longo manifeste gibboso, labio inferiore reflexo, labio superiore erecto intus glabro breviter trilobo lobis rotundato-ovatis concavis circiter 1.5 mm. longis; stamina 4, corollam subaequantia filamentis ad imam basin et ad partem tubo adnatam longe pilosis, tubo cetero intus glabro, antheris lineari-oblongis 3 mm. longis; stylus stamina paullo superans, basin versus densius infra medium sparse et supra medium sparsissime pilosus; ovarium biloculare loculis plerisque 4-ovulatis.

A plant of *Lonicera subsessilis* raised from seed collected by E. H. Wilson in Korea and received in 1917 flowered this year early in June for the first time in this Arboretum, affording the opportunity to complete the description of this species of which the flowers were before unknown. The species belongs to the division of the subsection Rhodanthae with connate ovaries and red fruit in which *L. conjugialis* Kellogg, *L. Tatarinovii* Maxim., *L. Maximowiczii* Reg., *L. Chamissoi* Bge. and *L. Graebneri* Rehd. belong and is most closely related to the last which has short peduncles and apparently pale-colored flowers, while the others have long and slender peduncles and dark-colored flowers, but *L. Graebneri* is easily distinguished by its pubescent leaves, longer peduncles, longer subulate pilose bracts, setosely ciliate bractlets and longer setosely ciliate sepals. A remarkable feature of this species will be its tetramerous flowers if this turns out to be a specific character and not an abnormal state; the fact that not only in the one shrub which flowered here all flowers without exception showed a 3-lobed upper lip and 4 stamens but that also in the type specimen the young fruits show only 4 calyx-lobes, as far as the latter have not fallen off, would indicate that the tetramerous flowers are a specific character. The only other species of the genus which has occasionally tetramerous flowers is *L. angustifolia* Wall. of the subgenus Isoxylosteum.

× **Lonicera Purpusii** (L. *fragrantissima* × *Standishii*), hybr. nov.

Upright shrub: branchlets glabrous, or particularly the longer vigorous shoots, loosely setose-pilose with reflexed hairs, the young shoots not bloomy; leaves elliptic-ovate or ovate to narrow-elliptic or oblong-ovate, 5–8 cm. long, and 2.5–4 cm. broad, acute to acuminate and mucronate, rounded to broadly cuneate at the base or sometimes the lower ones slightly subcordate, dark green and glabrous above, light green and reticulately veined beneath, and setose-pilose on the midrib and sparingly so on the lateral veins and veinlets or, particularly on the flower-bearing branchlets, nearly glabrous; petioles setose to nearly glabrous. Flowers very similar to those of *L. fragrantissima*, glabrous except some hairs on the margin of the bracts.

SPECIMENS EXAMINED: Botanic Garden, Darmstadt, Germany, *A. Purpus* 1920 and 1921 (flowers and mature leaves).

This hybrid originated spontaneously some years ago in the Botanic Garden at Darmstadt from seed of one of the parents. In its leaves it is

distinctly intermediate between the parents, their shape being more like that of *L. Standishii* Carr., while in the slighter or nearly wanting pubescence they resemble *L. fragrantissima* Carr. From the latter species the hybrid is chiefly distinguished by the presence of reflexed hairs on the shoots, which are not bloomy when young, the longer and narrower more or less acuminate leaves pale green beneath and often setosely pubescent on the veins and veinlets and by the ciliate bracts; from *L. Standishii* it differs chiefly in the often glabrous branchlets, in the much less hairy and often nearly glabrous leaves and in the glabrous or nearly glabrous flowers.

(*To be continued*)

ERRATA

Page 8, line 15 from above *for* subcandicanticantibus *read* subcandicantibus

" 22, line 9 from above for *Phorodendron* read *Phoradendron*

" 35, line 13 from above *for* Sect. 2 *read* Sect. 1.

" 45, line 2 from below for *palustris* read *palustre*

" 192, line 2 from below for *rupetris* read *rupestris*

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